DÆDALUS

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Foreword to the Issue "Current Work and Controversies"

THE QUALITY and vigor of intellectual activities in any field may be gauged in several ways, of which one is surely the intensity of interaction at certain areas of contact between the daily work of the scholar and the daily concerns of the nation as a whole. The height of the ivory tower may be measured by the farthest distance from which it can be observed, but this height may also be measured by the forces exerted on each other by the edifice and the ground on which it stands.

The main essays in this issue of *Dædalus* are grouped round the theme "Current Work and Controversies." They represent the large-scale effects which the work in a study or a laboratory may have upon the contemporaneous life of the whole community; and conversely, they also represent the lively controversy among academies generated by some of the urgent issues of the day.

The first article summarizes a study on the effects of the threatened general distribution of nuclear weapons upon world peace. The author, Howard Simons, has based his work on a formal full-length report prepared by a group largely composed of physical scientists. In the next two articles, René J. Dubos and Hudson Hoagland turn our attention to a set of far-reaching problems raised by the recent successes of the biological sciences. Then Father John L. Thomas and Dean John C. Bennett examine the practical implications of the use of a recent scientific discovery in medicine from the differing points of view of theologians.

Seymour M. Lipset's article on the changing role of the American intellectual was submitted to a number of fellow sociologists; as an experiment, the more controversial comments are printed with the article. The essays by Sumner Slichter and Solomon Barkin embody a debate between two schools of thought on the direction that should be taken by economic policy-planning in this country.

Among the remaining contributions, two controversies of quite different types appear. One is A. Hunter Dupree's reconstruction, on

the basis of Academy records and publications, of the actual debates on evolution held at the Academy between Asa Gray and Louis Agassiz just one hundred years ago. The other type of discussion involves two distinguished authors, P. W. Bridgman and Lewis Mumford, in the reappraisal of their own early and influential books.

After eighteen months of editorial silence, a brief report on the progress of *Dædalus* may be appropriate. In the first issue of the quarterly under its present Editor, in January 1958, the journal was charged with providing scholars in all fields (a group conceived of as an intellectual community rather than merely as a conglomerate of specialized professionals) with a medium for mutual converse. In retrospect this aim appears to court the Icarian retribution for audacity. Yet the evidence so far seems to show that *Dædalus* has answered the kind of need envisaged. The readership has been rapidly expanding beyond the Fellows of the Academy, and now houses have contracted to put the material in each of the last includes several thousand new subscribers. Commercial publishing six issues into regular book form. Much more significantly, the pattern of building most issues round a central theme has been well received, and it has become easier to commission good articles for future issues.

To a large degree these developments have depended on our good fortune in obtaining the help of devoted editorial assistance, particularly from guest editors and from among the advisors and consultants listed on the inside cover. Another essential element has been the fact that the Wesleyan University Press in 1958 joined the Academy as co-publisher and has assumed the entire burden of physical production and distribution. It is a pleasant duty to record these acknowledgments.

GERALD HOLTON

World-Wide Capabilities for Production and Control of Nuclear Weapons

HOWARD SIMONS

THE THREAT that many nations now without nuclear weapons will soon acquire them is profoundly disquieting to many thoughtful men. Today, three nations possess such weapons—tomorrow, the number may be four, five, six, or more. This trend has been characterized in the press as arising from a desire for membership in the "atomic club"; it is referred to by many scientists as the "nth country problem."

Whenever the problem has been discussed, it has aroused fear. Thus, John Foster Dulles wrote in 1957, during a discussion of the proposal for a NATO stockpile of atomic weapons, that we are confronted with the concomitant problem of "how to prevent the promiscuous spread of nuclear weapons throughout the world. Without safeguards, such weapons might in the future get into the hands of irresponsible dictators and be used as a form of blackmail. The world would indeed become an unhappy place to live in if humanity had to accept an ever-present threat of this character."[1] One may infer from Mr. Dulles' remark that even the existing threat of nuclear warfare is tolerable in comparison with that prospect. More recently, David Inglis, a senior physicist at the Argonne National Laboratory, has written, "The nightmare of a future with many nations capable of wreaking nuclear havoc and touching off the end of civilization has been haunting thinking men for several years."[2]

Most of those who have concerned themselves with the problem are agreed that in the absence of controls the probability of global

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suicide increases progressively with the number of nations armed with nuclear weapons. The facts that justify the fears will be studied below. But there is less agreement on how to treat the problem.

If we liken the development of nuclear weapons to a cancerous growth, the spread of such weapons to other countries is analogous to the metastasis of cancer invading hitherto normal tissues. Although the control of existing stockpiles of weapons in the countries that already possess them is a problem of appalling difficulty, there still appears to be time to check the development of metastases by preventive surgery—that is, by a wise combination of political and technical controls. As we shall see, however, time is running out.

Hitherto the few published discussions addressed specifically to this important problem have been nontechnical and largely impressionistic. In the summer of 1958 a small group of scientists under the auspices of the American Academy of Arts and Sciences undertook a study to determine the capabilities of nations now lacking atomic bombs for producing such weapons, and to examine the possible controls that could be imposed to prevent their doing so. Their *Report* is entitled *The Nth Country Problem: A World-Wide Survey of Nuclear Weapons Capabilities.* Its authors were William C. Davidon, a physicist at the Argonne National Laboratory, Christoph Hohenemser, a graduate student in the physics department at Washington University, and Marvin I. Kalkstein, a nuclear chemist at the Air Force Cambridge Research Center.[3]

There were three self-imposed limitations on the study: it was to be an essentially technical estimate, divorced as far as possible from political or military considerations; it was to be an evaluation of the possibilities of developing a homemade bomb, rather than one obtained through trade or aid; and it was to draw entirely on available unclassified information. The reasons for adopting these conditions were many. To cite a few, an unclassified technical study of the problem was lacking and urgently needed. If a nation could produce an atomic bomb by itself, any help from others would make the effort that much easier, simpler, and cheaper. One of the aims of the study was to assemble the available facts in the hope that the people, who must in the end participate in the decisions as to whether or not their governments should make nuclear weapons, may act on the basis of such facts.

What follows is largely a summary of the 227-page-long *Report* to the study group of the Academy by the research team of Davidon,

Hohenemser, and Kalkstein. The findings give cause for concern and should help to expedite toward controls.

The Problem and Its Significance

Nuclear energy programs are being developed in many nations. Whether these peaceful efforts become part of, or give rise to, nuclear weapons programs is still an open question. At least five bombless nations already have reported their intention of possessing nuclear weapons: China, France, Sweden, Switzerland, and Canada. The last, Canada, has for the present disavowed manufacture in favor of "imported" atomic arms.[4] Still other nations have remained uncommitted. As yet there has been no irrevocable hardening of the decisions. In democratic nations these decisions can be the responsibility of the people. It is important that this responsibility not be given up lightly, for only a step beyond these decisions is another more fateful one—the use of nuclear weapons once a stockpile has been accumulated. The responsibility for that decision is largely surrendered to the military.

Natural scientists, economists, social scientists, politicians, and the public—all must take an active role and voice in directing the fundamental decisions. As the *Report* states:

> The full assessment of the problem must include over-all goals and values of society; analysis of short and long-range political motivation; the economic capacity of countries to achieve their desired ends; and considerations of military strategy. While these areas are of prime importance, the immediate technological implication of the problem is relevant: Decision at this time is urgent before widespread reactor programs make possible the manufacture and stockpiling of nuclear weapons.[5]

It must be noted, too, that the decision of a nation to manufacture nuclear weapons affects the internal conditions of that nation: the expenditure of scientific manpower and industrial, economic, and natural resources must be weighed against the employment of these same talents and resources for other needs.

A great deal of the world's developing nuclear technology so far has been directed toward the peaceful use of the atom. In this aim, those nations most able to further this development have helped others. Supranational organizations have been planned or established to engage in nuclear power development and research.

> In most of these arrangements in the non-Communist sphere [the *Report* points out] specific measures have been taken to prevent the diversion

to military programs. Though no information was available on the control programs in the Communist countries, it is hoped that these too contain effective control measures to prevent military diversion.[6]

The Requirements and Capabilities

The line between open, peaceful, nuclear technology and bomb technology is narrow. The science upon which both technologies are based "represents the cumulative achievement of men from many nations over generations." The universality of basic phenomena underlies all considerations of the ability of countries to make nuclear weapons, as first the Russians and then the British demonstrated. For just this reason, evidently an atomic secret has a half-life, too. A "classified" imprint on the basic principles of a Hiroshima-type atomic bomb would be more a testimony to past "security" measures than to present reality. Except for some very important details of detonation design and isotope separation, good scientists anywhere may find in the open literature "all the basic facts they need" to embark on the manufacture of at least a 1945-model bomb.

On the basis of information available to us from unclassified sources what kind of fissionable material is needed to make a bomb, and how much? Of the isotopes of heavy elements that can be made to undergo fission, only uranium 233 (U 233), uranium 235 (U 235), and plutonium 239 (Pu 239) possess the combination of characteristics required for weapons production. The following considerations led the authors of the *Report* to single out Pu 239 as the material most likely to be used by an nth country in the initial manufacture of nuclear weapons.

1. Plutonium is an unavoidable by-product in the production of nuclear power with natural or slightly enriched uranium fuels.

2. The cost and complexity of the installation required to produce plutonium are at present less than that required for the production of weapons-grade U 235 by separation.

3. France has decided to base her present development of nuclear weapons on plutonium manufacture.

References in the literature to the mass of fissionable material needed for a nuclear explosion give the amount as "about the size of a baseball," or "little bigger than a cricket ball," and "seven or eight kilograms." These estimates are roughly identical, the authors of the *Report* say, and through these and their own approximate calculations, they conclude that ten kilograms of plutonium is a

reasonable amount of fissionable material to use when discussing the production of a twenty-kiloton (1945-model) bomb.

From the design to the weapon is a long, costly road strewn with obstacles. Help from others can introduce short cuts. Lacking these, the *Report* points out:

> The completely independent manufacture of nuclear weapons depends on a considerable industrial system which includes the following processes: mining and milling; refining; fuel element fabrication; operation of reactors or isotope separation plants; chemical and metallurgical processing of intensely radioactive materials; and bomb assembly. It requires a considerable over-all level of economic, industrial, and scientific capabilities.[7]

This should not suggest that the problems of manufacturing a plutonium bomb are insurmountable for any nation below the "first-rate power" level. The contrary will appear to be the case. We now trace step by step how the *Report* evaluates the technical requirements and technical capabilities for bomb production.

The Availability of Fissionable Material

To begin with, plutonium will have to be made by the irradiation of natural uranium, the only material that yields usable reactor fuel directly upon the chemical processing of the naturally occurring ores. Natural uranium is the fuel currently being used in the large reactors producing plutonium for weapons use at Hanford in the United States, at Calder Hall in England, at Marcoule in France, and presumably in the Soviet Union. Eventually, Pu 239, U 233, and enriched uranium can also be used, but these require either the previous operation of power reactors or the use of isotope separation plants.

Natural uranium is not a scarce commodity. If it were, the nth country problem might not exist. Important known deposits of uranium and thorium are fairly evenly distributed throughout the world. As of 1956, it was estimated that there were more than one thousand mines in some thirty countries.[8] Certain industrially capable nations have no significant ore deposits within their borders, namely the Scandinavian countries, Austria, the Netherlands, Italy, Japan, Switzerland, and Turkey. This is not a serious handicap, however. Under present world conditions these nations can count on buying ore from one of the large producers—Canada, the United States, the Soviet Union, the Union of South Africa, and the Belgian Congo.

Neither mining the ore nor milling and refining presents any serious problems. Mining and concentration are accomplished with conventional equipment and techniques. Milling is essentially a leaching process. Likewise, refining and reducing the crude milling-plant product to metal is achieved by fairly routine techniques using common chemical reagents. The production of thorium follows roughly the same general pattern.

There are two over-all programs that can be developed for plutonium production: the one in which the plutonium is a by-product of electrical power production; and the other in which the plutonium production is an end in itself. The irradiation of the natural uranium by neutrons within a typical reactor produces both energy and Pu 239. The *Report* estimates that one hundred metric tons of natural uranium will have to go through such a reactor in a year to produce 20 kilograms of weapons-grade plutonium, or enough for at least two nominal bombs.

A reactor used exclusively for the production of plutonium, where heat is generated at a relatively low temperature, permits the circumvention of many formidable problems that arise when the same reactor is being used to produce electrical energy. Plutonium production joined with electric power output also requires a more advanced national industrial development. On the other hand, where these more complex electrical power reactors exist – constructed independently of a weapons program–they could be used for the production of weapons-grade plutonium as a by-product. Sweden, for example, by operating her power reactors for plutonium production could, by 1960, produce enough unprocessed plutonium for five or ten nominal bombs.

Installation Requirements

The construction of a reactor installation is beset by the same general demands as is any large industrial plant in the making (as machine and electrical shops, materials-handling and storage facilities), as well as those exacting requirements unique to nuclear technology (as the fabrication of fuel elements, heat transfer problems, the problems resulting from radiation). But reactors do not have to be homemade. Like uranium, they are available in the world marketplace. Canada, the United Kingdom, the United States, and the Soviet Union, all are engaged in the export of reactors. There is even a marked degree of sales competition among them.

In the case of the non-Communist nations, most export agreements provide for peaceful reactor operation only, and include control measures to insure this end. There are exceptions, specifically the known military agreements between the United States and Great Britain, and the United States and Canada. Although neither of these agreements had yet resulted in the physical transfer of reactors when the *Report* was written, shipments of the necessary materials had been made. The *Report* notes further:

> In the Communist countries a military agreement is rumored to exist between the Soviet Union and China, which has resulted in the transfer of four reactors of unspecified purpose and capability. In addition, other agreements for cooperation exist between the Soviet Union and other countries, but it is unclear from the references available whether these are military, peaceful, or both.[9]

In addition to a reactor installation, whether built or bought, a chemical processing plant is also needed for plutonium production. It is required to treat the intensely radioactive fuel elements that must be periodically removed from the reactor to recover the fissionable material and to restore reactivity and chemical and physical properties to the fuel. The problems associated with the construction of a chemical processing plant are almost equal to those of reactor development: remote handling is necessary; extremely high recovery efficiencies are demanded (95 per cent is generally considered too low); much of the plant equipment must be leakproof and capable of repair and replacement by remote means; and the intensity of the radioactivity necessitates a rather large physical installation to accommodate protective shielding and protective distances. The processing plant for plutonium separation at Marcoule in France (producing about 110 kilograms per year) gives an indication of the scale of operation involved. The plant is 170 meters long, 37 meters wide, and 17 meters high. It contains 14,000 cubic meters of concrete and 34,000 tonnes of lead. It is estimated that its round-the-clock operation requires approximately 60 workmen and engineers.

A problem that arises at the end of the chain of chemical processes leading to weapons-grade fissionable material is the disposal of radioactive wastes. About one gram of fission product is obtained for every gram of U 235 consumed. In the production of 20 kilograms of plutonium, it is estimated there will be 28 kilograms of fission products. Currently, the bulk of these wastes or fission products is being

stored in solution in large tanks. It is generally agreed, however, that the over-all problem of radioactive waste disposal remains to be solved satisfactorily, even for present volumes of production.

Although the *Report* dwells on plutonium production, in the belief that this is the most logical fissionable material for an nth country to use initially, there are other sources for a bomb ingredient. These are discussed in the following passages.

The separation of U 235 from natural uranium appears to be essential for a complete nuclear development program, whether for peacetime or military uses. The operation of reactors using enriched uranium permits the use of light water moderators, longer fuel cycles and other advantages. The lower spontaneous fission rate of U 235 is at least one of the reasons why it is used in weaponry. However, the isotope separation plants to handle the quantities of materials necessary are a very major scientific and economic development. H. D. Smyth stated [*Atomic Energy for Military Purposes*, 1946] that "many special problems arose in the separation projects which were extremely interesting and require a high order of scientific ability for their solution but which must still be kept secret."

An additional limitation on the construction of isotope separation facilities in additional countries is that, unlike power reactors, there is presently no active international program for their development. They would therefore require a more completely independent design effort, and in view of considerable technical problems, this would limit their manufacture to fewer countries than are now planning power reactors. Another factor which would reduce the number of countries that would make isotope separation plants is the large amount of electrical power that is required. This power consumption, combined with the large scale of such plants, would also make their concealment difficult.

It should be mentioned that the French demonstrated a major exhibit on isotope separation at the Second International Conference for Peaceful Uses of Atomic Energy.

Another way to produce weapons material is by neutron capture in thorium to form U 233. For the conversion of thorium to U 233, Canada is now aiding India in the development of a large power reactor to be used in India where thorium ores are more plentiful than uranium. The basic steps in the manufacture of U 233 parallel those for plutonium manufacture, with Th 232 replacing U 238 as fertile material. It is reasonable to assume that the over-all costs would be about the same as for plutonium manufacture. However, the present state of reactor technology is less highly developed for breeding or converting to U 233 than it is for converting to Pu 239, and hence there may be unforeseen problems in economic large scale production.[10]

The Costs in Money and Man Power

So far in our review of atomic-bomb manufacture, we have been largely concerned with engineering considerations. But each of these considerations costs money. Nuclear-weapons manufacture is a high-priced luxury that few can well afford.

One can estimate the costs of a model weapons program aimed at producing a few bombs. The model is based on the following assumptions: two or three years for planning, design, and construction of plant facilities; an additional two or three years for the production of material and the assembly of the weapons; and a final output of twenty kilograms of plutonium per year.

These costs are summarized in the following table:

STAGE IN DEVELOPMENT	CAPITAL COST (millions of dollars)		ANNUAL OPERATING COST (millions of dollars)	
	Pu from power reactor	Weapons-grade Plutonium	Power	Weapons-grade Plutonium
Uranium (ore to metal)	0.5	1.0	0.5	4.0
Fuel element fabrication	0.5	1.0	0.5	1.0
Moderator preparation (heavy water)	3.0	3.0	1.0	1.0
Reactor	24.0	16.0	1.0	3.0
Chemical processing	6.0	18.0	0.2	2.0
Waste disposal	3.0	3.0	1.0	1.0
Bomb assembly	10.0	10.0	5.0	5.0
Total	47.0	52.0	9.2	17.0

These estimates, as the authors of the *Report* carefully point out, must be regarded as merely approximate and subject to uncertainties:

> Probably the largest variation in these figures would be dependent upon the country involved. These estimates were made for highly developed industrial countries where talent and equipment are readily available. Since a large share of the costs estimated in this study are for labor, the same activities may cost considerably less in those areas where labor is cheap. As in all human endeavors, the presence or absence of one or two brilliant men could make an appreciable difference. Finally, if controls or other considerations make it necessary to conduct the work on a clandestine basis, camouflaging measures would probably increase the costs considerably.[11]

In estimating the costs of nuclear-weapons manufacture, a comparison was made between a straight plutonium-for-weapons program and one joined to an electric power program. At first look it

might appear that the latter is cheaper—the total cost for producing twenty kilograms of plutonium over the initial five-year period would be approximately $90,000,000 for a weapons-grade program and about $70,000,000 for a power-producing program. But there are hidden costs in the latter that must be added to its total. In addition to some of those already noted, there is, for example, the price paid for minimizing "poison." When plutonium is produced by neutron irradiation of U 238, the same irradiation also converts some of the Pu 239 to Pu 240, which has a high spontaneous fission rate that can "kill" the effectiveness of the plutonium for weapons use. To counteract this necessitates a more frequent processing of fuel elements, which requires serious modifications in design and higher operating costs.

In considering these costs, a nation is not entirely dependent upon its own budgetary considerations. Just as material aid is available, so too is financial aid in the form of loans and grants. The United States, for example, offered in the summer of 1955 to underwrite one-half the cost of research reactors, and by the end of 1956 Brazil, Denmark, the Netherlands, and Spain had received such grants. Similarly, the International Atomic Energy Agency can provide assistance for Agency-approved projects. These loans and grants, however, are designed to help in the development of peaceful nuclear energy programs, and at present no military uses can be made of this aid.

Uranium ores, skilled technicians, financial resources, and impetus are still not enough to enable a country to undertake the manufacture of atomic weapons. It also requires high over-all levels of industrial and economic activity—and of talent.

Utilizing a limited set of criteria, the economic capability of thirty-seven countries was studied. The criteria chosen included: the estimated value added annually to the industrial product; steel production; annual electrical energy output; and indicators to determine the scope of the chemical, machine, and construction industries.

A related estimate was made of the number and quality of trained scientists. It should be noted that a serious lack of available data hampered the efforts of the research team to evaluate world-wide scientific manpower (and points up the need for such an estimate). Despite this handicap, some manpower factors were evident, such as:

The training of nuclear scientists has one property which should be emphasized. This is that much specialized equipment is necessary for

almost all phases of the process. For this reason proper training can be done only at certain universities, and in any over-all evaluation, this must enter as a dominant criterion.[12]

Who Can Make Bombs?

When all the aforementioned factors were taken together, the research team arrived at the following judgments.

1. Twelve countries are technically able to embark on a successful nuclear-weapons program in the near future, most of them being highly industrialized and having either operating reactors or arrangements for obtaining reactors: Belgium, Canada, China, Czechoslovakia, France, East Germany, West Germany, India, Italy, Japan, Sweden, and Switzerland.

2. Eight countries are considered to be capable economically and fairly competent technically, although perhaps somewhat more limited in scientific manpower: Australia, Austria, Denmark, Finland, Hungary, the Netherlands, Poland, and Yugoslavia.

3. Six countries are probably economically capable, although more limited in industrial resources and scientific manpower, but it is not likely any or all could achieve a successful nuclear-weapons program within the next five years: Argentina, Brazil, Mexico, Norway, Spain, and the Union of South Africa.

The other countries studied were judged to be not technically and economically capable of manufacturing their own nuclear weapons.

Controls

Up to this point, we have considered the possibilities of the production of nuclear weapons in many countries. That this production may happen, however, is no proof that it must happen. Unless each weaponless nation imposes the ultimate control—that of forswearing nuclear arms—some other means of effective and universal control will have to be found.

Controls require agreements and the technical means to effect them; the one is dependent upon the other. It is apparent that both must be world-wide in scope to be completely effective, and that they can best be managed through an international organization such as the United Nations or the International Atomic Energy Agency. The *Report* leans toward the latter as the logical agency for international control, although its sympathy is with any international body that can bring a halt to, or control, nuclear-weapons development.

The International Atomic Energy Agency (IAEA) grew out of

President Eisenhower's "Atoms for Peace" address before the United Nations General Assembly in 1953. Since then the charter for the IAEA has been written and eighty nations have ratified it. The Agency has been an established concern for over a year. It would be fair to say, however, that it is as yet more so on paper than in practice. The chassis and engine are there—what seem to be missing are spark plugs, fuel, and passengers. One of the blocks under the wheels of the Agency is the fear on the part of the "developing" nations that the Agency will interfere in their internal economic affairs.

Recognizing that the IAEA is beset by difficulties, the *Report* contends that "it nevertheless provides a unique basis for international nuclear weapons control." The general control responsibilities of the Agency include: (1) the approval of the design of facilities; (2) the establishment of health and safety measures; (3) adequate records of production and progress reports; (4) the prevention of the diversion of plutonium and other fissionable materials after processing; (5) inspectors with complete freedom of access; and (6) in the event of noncompliance, the termination of assistance from the Agency.

It is not clear from existing documents what specific technical provisions are necessary to insure these safeguards, but all indications are that controls to prevent the diversion of fissionable material are feasible.[13] "The most detailed public statement on the matter," the *Report* says, "has come from Dr. Richard Kirk, assistant director of International Organizations, the United States Atomic Energy Commission. Mr. Kirk's main point is that the problem of safeguards is nothing new, since it involves well-seasoned procedures used for the purpose of efficiency in running the United States atomic energy establishments, or for that matter any large business."[14]

Many have lauded the promise of the Agency as offering "the best hope that has hitherto appeared of beginning to reduce or limit the anarchy currently prevailing in the weapons field."[15] The *Report* agrees with this estimation, but tempers any overoptimism with the following reservations.

1. The Agency is powerless to place controls except when aid is given or a specific request for such controls is made (and neither had taken place at the time of the *Report*).

2. Unless an imaginative scheme for controls and inspection is worked out, some strongly nationalistic powers might balk at Agency interference.

3. The high cost of controls, which must be reimbursed to the Agency, makes it presently noncompetitive with what the major powers offer in bilateral agreements, thus eliminating large-scale assistance and concomitant controls.

4. It is still unclear to what extent the Soviet Union supports the Agency.

5. The People's Republic of China is not a member of the Agency.

Despite the above shortcomings of the IAEA—none of which seems unalterable—the *Report* describes it as "the kind of organization that can function effectively in preventing the emergence of new nuclear powers." There exists, the *Report* contends, in the Statute of the IAEA an outline of control measures, including administrative detail, that would be "sufficient to put into immediate effect an immediate halt on nuclear weapons development in the nth countries" where Agency help was being used.[16]

These same problems and promises were pointed up recently by W. Sterling Cole, Director General of the IAEA, when he chided the nuclear powers for neglecting to cooperate fully with the Agency.

> The first decision which must be made [by the nuclear powers] is clear and straight-forward. It is simply the decision that, having created an international body for defined purposes in connection with atomic energy, the Agency should be supported not only with generous financial contributions—as has been the case of the United States—but fully and without qualification in its operational aspects.
>
> We can be only partially effective if some nations maintain parallel machinery to do the same thing as the Agency but subject to individual-nation selection, manipulation and control.
>
> Once this decision has been made, and with determination to sustain it, the subsequent steps become equally clear and straight-forward: to discontinue further bilaterals or multilaterals [agreements], to begin to place under Agency administration the health and safety and materials safeguard measures embodied in existing bilateral and multilateral agreements, to begin to channel all atomic foreign aid through the Agency, and to start work on the instrument which will make possible the registration and accounting control of the nuclear fuel materials.[17]

If one agrees with these considerations, there can be little argument that the International Atomic Energy Agency offers an attractive foundation upon which the world can build both an effective control of nuclear-weapons programs and, at the same time, an effective international program for the peaceful use of nuclear energy. Also, it is relevant that the Agency does not have the problem of a veto.

Other International Agreements

In addition to the existing international bodies that might serve as reins on the Fifth Horseman, two other kinds of international arrangements may be considered briefly: bilateral agreements, and groupings of nations banded together to exploit the atomic nucleus for their common good.

Bilateral agreements involve a large segment of the world. The United States, Canada, Great Britain, and the Soviet Union, all have entered into bilateral agreements with other nations involving nuclear matériel. The United States alone, by the end of March 1958, had signed forty-one such treaties with thirty-nine nations (including eleven agreements that allowed the transfer of power reactors and power-reactor materials). Concerning these bilateral agreements, the *Report* makes four significant points: (1) the controls written into the United States treaties embody a policy of insuring inspection so that fissionable materials are not diverted; (2) the transfers from all nuclear powers to other nations carry with them potentially dangerous installations; (3) the agreements contain no world-wide responsibility; (4) the existence of a choice of such treaties may cause a nation to play one nuclear power against another, and in so bargaining, demand and receive a weakening of the control mechanisms.

The second type of arrangement, that of international groupings, is widespread too. In addition to the IAEA, seven other such organizations for nuclear research and development are in existence or are planned. They differ widely in both scope and make-up. There is the two-nation Joint Establishment for Nuclear Energy Research (JENER), organized by Norway and the Netherlands, which employs a 700-kilowatt reactor; and there is the twenty-two-nation Asian Nuclear Center being established in Manila to train nuclear scientists, engineers, and technicians. There is EURATOM, which has perhaps the most ambitious program, and the Russian-sponsored Joint Institute for Nuclear Research (JINR) engaged in high-energy particle research. The list also includes the Conseil Européen pour la Recherche Nucléaire (CERN), the Inter-American Nuclear Energy Commission, and the Organization for European Economic Cooperation (OEEC).[18]

For the present, most of these organizations are engaged primarily in research and the training of personnel, and are not included in the

Report in the discussion of control. There is, however, one exception – EURATOM. This is a federal authority in western Europe similar to the European Coal and Steel Community. EURATOM's present nuclear-power goals involve the production of 1000 kilograms of plutonium by the year 1963. Significantly, a means of control to prevent the diversion of fissionable material to military use

> is present in the EURATOM agreement which is not specifically mentioned in either the IAEA Statute or the United States bilateral treaties. Fuel elements are to be fabricated for $100 per kilogram of contained uranium, and must last for 10,000 megawatt-days at a time; or if these criteria are not met, any additional expense must be canceled by decreased processing costs. If it can be safely assumed that radically reduced processing costs are not feasible, then the first criterion in effect is a measure to prevent the production of weapons grade plutonium, because the high burn-up of 10,000 megawatt-days at a time would cause excessive Pu 240 contamination [poisoning].[19]

The Evaluation of Technically Possible Controls

Perhaps the most meaningful finding of the nth-country problem study is the simple and sobering fact that technical controls to insure a halt to the spread of nuclear-weapon development are possible. Various methods exist, the *Report* states, "for providing all countries with additional assurance that others are not engaged in the clandestine production of nuclear weapons." These methods vary in the assurance afforded, in their cost and complexity, and in the "extent to which they promote or interfere with the non-military uses of nuclear energy."

Three such controls are discussed: a world-wide test ban; the control of fissionable material; and manpower and budgetary controls. Each will be useful, the *Report* notes, in focusing on aspects that are unique to those countries that have not yet created a stockpile of nuclear weapons.

The test ban. If nuclear-weapons tests became subject to an international ban, their cessation would present a serious obstacle to the undertaking of a new nuclear-weapons program. It would not interfere with the production of fissionable material, nor could it prevent preparation up to the eve of a test, but "such a ban might well discourage a country from expending the money and resources required to stockpile a 'weapon' that had never been tested." A country would be unlikely, by the same token, to modify its military or political strategy on the basis of a weapon of uncertain characteristics.

The control of fissionable material. Several different approaches can be taken to insure that fissionable materials should not be used for weapon production. These include the use of Pu 240 to "poison" or "denature" weapons-grade plutonium; the use of monitors on the fuel elements to indicate what a given reactor is being used for; and a careful inventory of Pu 239 to balk theft or diversion. Of course, any nuclear program can be specifically designed to facilitate control; one possibility is to discard or control the storage or use of spent fuel elements, or to have them processed by an international organization. With safeguards, the *Report* asserts, a nation would have to engage in a subterraneous operation to produce weapons materials; the size and scope of such an operation would make this attempt very unlikely. In addition, there are telltale signs in the form of energy release, in radioactive discharge, and in "hot" wastes that sensitive measurements could detect.

Manpower and budgetary controls. It is also difficult to hide a large expenditure of talent and money. Both can be, and have been, hidden in the past. But the fact of international communication among scientists offers some indication of outward or secret activity in the nature of "missing persons" at meetings and in journals and private communications. A detailed analysis of the budgets of countries could provide a similar indicator. The authors of the *Report* express the opinion that, although manpower and budgetary controls are limited in reliability, their value as both indicators and controls should be explored.[20]

Some Conclusions of the Report

The *Report* comes to the following conclusions.

1. The physics of the pure-fission bomb is so widely understood today that a nation determined to manufacture a bomb would not have to hesitate for lack of basic scientific information.

2. The production of a few Hiroshima-sized atomic bombs is well within the reach of some ten or more countries.

3. The time required for such an achievement would be on the order of five years, at a total capital cost of more than $50,000,000, and a total yearly operating cost of about $20,000,000.

4. The time could be cut, for in traveling the road to an operational power reactor (and there is some reactor activity in forty-two countries) a nation is simultaneously covering one-half the distance to an operational plutonium bomb.

5. Because the process for the independent development of nuclear weapons is complex and time-consuming, there is little question that a "fool-proof system of controls could easily be designed" for such independent work.

6. There exists, today, in the Statute of the International Atomic Energy Agency, an outline of control measures adequate to halt the spread of the development of nuclear weapons to nth countries.

If this study showed anything [the authors say], it surely showed that the emergence of new nuclear weapons' countries is more imminent than would have been supposed; that a minimal weapons' program is within reach of more countries than one would expect from the legend of the "great secret"; and finally, that controls of a weapons-production program should be a much simpler technical problem compared to the difficulties that exist in controlling stockpiles.[21]

Some Implications

The authors of *The Nth Country Problem Report* are fully aware that the technical implications of a wider distribution of nuclear weapons cannot be divorced from the military and political implications in any over-all consideration of the problem. They make this clear both by direct statements and by raising a series of political questions that invite thinking men to dwell upon them in the hope of arriving at the "intelligent formulation of policy."

The nth country problem is not new. It was seen even before the world's first atomic dust settled, and it has been seen by many since. What is new is the proximity of a bad solution of the problem—the spread of atomic weapons.

As long as military strength is the obvious measure of the power of a nation, certain "developed" nations will want to possess nuclear arms despite the moral, political, and financial cost. For some "developing" nations the motivation could be prestige and pride in the guise of mid-century nationalism, that particular brand of vanity that demands the immediate overtaking of technologically more advanced countries. For some smaller "developed" nations the motivation could be an honest belief in self-defense through atomic deterrence. And, although questionable, there is a school of thought on atomic weapons that considers the possession of a few bombs a necessary evil, an insurance against atom-armed aggressors.

For the above reasons and in the absence of a permanent international-controls program to restrict the spread of nuclear weapons, the

world is precariously balanced on a makeshift atomic-arms concept that is temporary, dangerous, and fluid. For example, there seems to be a certain feeling of assurance that as long as nuclear weapons remain restricted to the present antagonists there can be political control by the Big Two. However, once nuclear weapons pervade other areas, such as Asia and Africa, this assurance becomes questionable. There could be little doubt, for instance, that if Israel possessed an atomic bomb and her national existence were seriously threatened, she would use it. Similarly, Egypt might, if she alone in the Near East possessed atomic weapons, attempt to erase Israel. Even those nations that find it morally repugnant to possess nuclear arms today may be forced to ignore their consciences tomorrow. For example, if the People's Republic of China had atomic weapons, could India remain complacent?

Some Limited Solutions

Any discussion of the political aspects of a possible plethora of atomic arms must invoke the entire foreign-policy nuclear-weapon vocabulary: massive retaliation, graduated deterrence, limited nuclear war, balance of power, atomic umbrella, denuclearization, disengagement, mutual deterrence. All the conceptions for which these terms have become catchwords are ultimately directed toward the same end – the prevention of nuclear world suicide. This is not the same objective as unlimited peace; admittedly, most of these concepts offer limited solutions. But the history of mankind has been hammered out through a series of accommodations, compromises, and limited solutions. In short, man has survived through limited war and limited peace. What is different at this point in history is the unlimited characteristic of an alternative to limited solutions – a holocaust so overwhelming in its potential as to imperil all of civilization.

Each concept of a limited solution has its partisans and its critics. And each group of adherents to this or that policy plays upon its theme with logic, conviction, and insight. In turn, the critical groups (some of whom are critics by way of being adherents to an opposing policy) are equally adept. It would require a book to set forth all the arguments involved in the many approaches to nuclear armament or disarmament. Some have been articulated widely, others not. It is useful to touch here upon at least a few; for, to paraphrase, all solutions are limited, but some solutions are more limited.

There is an opinion, for example, that the dissemination of nuclear weapons may restore the "ancient pattern" of a balance of power. A restrained and perceptive estimate of this possibility was made in that relatively simple atomic year 1946 by Jacob Viner of Princeton University:

> The development of the atomic bomb promises to restore some military significance to the weaker countries: it gives a strong weapon to *any* country able to use it. It thus tends to make all countries strong, or make all countries weak, as you prefer. It seems doubtful, however, whether it goes, or will go far enough in that direction, whether it will scatter military power widely enough to exact obedience from any single country. Should it do so, however, then not only an effective balance-of-power system but world government will again be possible and to the discovery of the atomic bomb will belong the credit. On the other hand, the atomic bomb removes the physical and administrative restrictions on warfare which helped to make "limited warfare" attractive even to aggressors and therefore tends to deprive the balance-of-power system of its only merit with respect to the issue of peace or war, namely, that it reduces the damage done by war when war does occur.[22]

A different approach to balance of power is taken by Carl J. Friedrich in a paper in preparation. Mr. Friedrich sees the contemporary bipolar world evolving into a multipolar world as the result of the rise of ten or twelve strong nations and groupings of nations, such as a United States of Europe, the British Commonwealth, a Pan-Arab bloc, a Pan-African bloc, India, China, and Indonesia. Thus, by enlarging the pattern within which a balance of power operates, the tensions attendant upon a bipolar competition may be mitigated and the danger of conflict reduced.

There are those who see an immediate need for the United States to furnish her NATO allies with nuclear weapons. Klaus Knorr of Princeton University has cited several of the current arguments in favor of this approach:

> By showing a readiness to make nuclear weapons available to its NATO allies, the United States would act in the full spirit of a close partnership for defense . . . this would strengthen NATO, boost West European resistance to Soviet threats, increase the retaliatory power which is relied on to deter Soviet aggression and diminish the possibility that any West European states might act inimically to American interests . . . [it] would save them from the heavy expenditures that they would have to incur in duplicating (in part at least) the research development and production effort already made by the United States . . . it would minimize the testing

of nuclear explosives. . . . Finally, if the United States supplied nuclear arms to its allies within the NATO framework, it would be in a position to assure that they were under collective rather than individual national control.[23]

Inherent in the desire of some that the United States give nuclear weapons to her allies is the belief that a similar effort on the part of the Soviet Union would not be as profitable militarily. Most assessments of the relative advantage to either nation in the distribution of nuclear arms favors the United States, at least for the moment. As one observer puts it, "Polish pilots have a poor sense of direction."

Inherent, too, is the argument of many that the West is in a struggle to the death with an enemy who never sleeps. Robert Strausz-Hupé of the University of Pennsylvania gives this opinion:

For the Communists, war is just one mode of protracted conflict, and the objective determines the scope of military violence or of any other technique of conflict. Atomic weapons, including thermonuclear bombs, are integral parts of the Soviet conflict machine, preferably to be used as psychological and diplomatic instruments, but ready to be used, if need be, as fire power. The Communists are as well aware as we are that they will suffer terrible losses in a thermonuclear duel. But they do not surrender to the "conventional obsession." Nuclear weapons of all sizes are here to stay, and wishing will not put them back in Pandora's box.[24]

What Can Happen

Attractive as some of the arguments for a spread of atomic-arms possession can appear, they seem to neglect some obvious, but perhaps less publicized, possible consequences of just such a distribution. A wider dissemination of nuclear weapons can have a variety of grave results – accidental atomic war, demagogic atomic war, nuclear blackmail, or, at the least, a far greater difficulty in obtaining controls programs or disarmament.

Accidental atomic war can result from a true accident in which a homemade bomb explodes and a suspicious neighbor is blamed, or it can result from the independent action of a field commander, or it can result from a premature military estimate.

Demagogic atomic war can result from the machinations of an "irresponsible dictator," or from the calculated risks of a "responsible dictator," or from a falling dictator's last attempt to maintain power.

What appear to be the precursors of more concrete attempts at nuclear blackmail have already been tried twice. The first occasion did not involve atomic weapons, but the alleged production of atomic

energy. On 25 March 1951, Juan Perón announced that Argentine scientists had produced atomic energy. The totally fabricated announcement was made on the eve of an Inter-American Foreign Ministers Conference and there is evidence that the Argentine dictator's pronouncement was made to impress, if not threaten, the delegates to the Conference.[25] The second occasion was the Soviet Union's threat to rain rockets upon England and France, presumably with atomic warheads, unless these nations ceased their action in the Suez affair. This threat appears to have played a part in the decision to withdraw.

If agreement on controls is as difficult as the recent exchange of charges and countercharges during the Geneva discussions indicates, we have a measure of the appalling difficulty of the problem if a larger number of nations were involved in control negotiations. By the same token, manpower and machinery for inspection controls increase with the addition of each new member to the "atomic club." If this is not too much of a burden, the concomitant and very difficult problem of expanded stockpiling may well be. This latter dilemma is discussed in the summary of *The Nth Country Problem Report* as follows:

> Briefly, the big difference between nth country controls, and the chief problem of controls for the nuclear powers is that in the case of the nuclear powers, the problem is one of finding existing weapons—generally small and concealable objects—while in the case of the nth countries, the problem is one of finding huge industrial plants, run by many hundreds of employees. At the same time, one must not fail to realize that controls for the nth countries will be more difficult to achieve than present Soviet-American controls once weapons have been developed and stockpiled, for the problem will then be that of finding a needle in many "sovereign haystacks," instead of just two.[26]

In considering the above-mentioned dangers, it seems fair to say that they have received far too little attention or debate in the public forum.[27] This is not to intimate that they have been totally neglected. They have entered into the formulation of those few bold and imaginative schemes aimed at ameliorating the potential threat of world atomic suicide. One of these schemes, which appears to be gaining news space if not some favor, is that championed by George Kennan – disengagement. Just as there are those who call for the nuclearization of certain world areas, there are those like Mr. Kennan and Sir Stephen King-Hall who call for the denuclearization (as a part of

disengagement) of certain world areas.[28] Commenting on these views, Raymond Aron says:

> I do not deny the dangers which would arise from such a distribution of atomic armaments. But what other prospect is there, once disarmament is ruled out? The one proposed by Mr. Kennan: a renunciation of atomic armaments by every state except three, coupled with a decision, in particular on the part of the European states, to oppose Soviet power by the threat of national resistance, passive or active.
>
> The European "home guard" idea put forward by Mr. Kennan echoes a similar proposal by Commander King-Hall. In the long run this is perhaps one of the paths to salvation open to humanity. But I do not believe that for the time being the European democracies can or should make the choice recommended to them.[29]

Significantly, the grave results of a wider distribution of nuclear weapons have not gone unnoticed even by those who advocate the use of nuclear weapons when and if the need arises. In discussing these same dangers, Henry A. Kissinger, who only recently called for the "creation of a Western European atomic force,"[30] noted in his book *Nuclear Weapons and Foreign Policy:*

> This is not to say we should be complacent about the prospect of a world armed with nuclear weapons. The possession of nuclear weapons will create tense situations among the secondary powers themselves, and acts of desperation against stronger states, while militarily inconclusive, may set off a cycle of violence difficult to control.[31]

Nor have they gone unnoticed by those who are in search of alternatives to a nuclear war of any dimension. Raymond Aron, in his essay "On War," commented on the possible arrival of Mr. Dulles' "unhappy world":

> This first enlargement of the atomic club will not perceptibly increase the probability of an explosion. The rulers of Europe will calculate the consequences of their actions more or less as the United States and the Soviet Union have done. However, the more numerous the states equipped with nuclear weapons, the greater the possibility, mathematically and inexorably, of insane decisions, and the further away the prospect of international agreement. How can we expect rival states to agree if allied states cannot bring themselves to share secrets (which are no longer secrets)?[32]

M. Aron offers this succinct comment in conclusion: "One fact seems almost certain: the possession of nuclear weapons by the majority of states will make us long for a return to the bipolar system."

The balance between the dreadful and the hopeful results of a spread of nuclear weapons beyond the present nuclear powers leans clearly to the former. The latter seem based in a large measure on nationalistic, short-range military considerations. But alliances change. Friends become enemies. Both the United States and the Soviet Union cannot help knowing all this, cannot help seeing a loss of their ability to control things if atomic weapons are made or imported abroad. Other nations cannot help noting these factors too, and one wonders whether or not these other nations might privately desire a path to escape honorably from the internal and external pressures to possess nuclear arms.

The world and its people have become preoccupied with "warning time" about so many of the problems of today, it would indeed be doubly tragic if when ample alarm has been sounded, the result should be a failure to do something about it. The nth-country problem is not an accomplished fact. Something can be done about it. This, coupled with the potential horrors that can result if the problem is left to develop, must be evident to the nuclear powers. Here, perhaps, is the main incentive to the antagonists to get down to a quick discussion of these problems, a step toward the realization of a mutual interest in decelerating the weapons race.

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18. For a full description of the countries and projects involved in the national nuclear energy programs, see Davidon, Hohenemser, and Kalkstein, *op. cit.*, Table III-6.
19. *Ibid.*, ch. IV, p. 9.
20. See S. Melman, *Inspection for Disarmament*. New York, Columbia University Press, 1958.
21. Davidon, Hohenemser, and Kalkstein, *op. cit.*, ch. V, p. 4.
22. Jacob Viner, "The Implications of the Atomic Bomb for International Relations," *Proceedings of the American Philosophical Society*, 1946, *90*, 53-58.
23. Klaus Knorr, "Nuclear Weapons: 'Haves' and 'Have-Nots,'" *Foreign Affairs*, October 1957.
24. Robert Strausz-Hupé, "Nuclear Blackmail and Limited War," *The Yale Review*, Winter 1959.
25. At the time Perón made the announcement, he claimed that neither uranium nor plutonium had been utilized, and Ralph Lapp suggested that the dictator had used "baloney." Of course, an announcement by a technically capable nation that it had produced atomic energy would elicit no such comment today – an indication of the rapid spread of nuclear technology.
26. Davidon, Hohenemser, and Kalkstein, *op. cit.*, ch. V, p. 3.
27. Parenthetically, it should be noted here that the question of inspection and controls, once stockpiles of nuclear weapons are established, is all too often dismissed as "hopeless." It has been suggested that a hard look at the problems attendant on stockpiling be taken by a group of technically competent and interested persons – a study that has been neglected for many years. (Private communication to the writer from Bernard T. Feld.)
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Medical Utopias

Rene J. Dubos

1

Medicine has been called the mother of sciences. In the minds of most medical men the "basic sciences" are identified with the physical, chemical, and biological theories and techniques used in the laboratory. And indeed, it is apparent that the laboratory has provided the most successful opportunities for the interplay between medicine and basic science during modern times. True enough, the study of psychoses has also revealed fascinating phenomena that throw light on other aspects of human nature, but few of these can as yet be studied in the laboratory. It is probably for this reason that the study of the mind does not rate high among "basic sciences."

The present subject occupies an even lower place in the pecking order of sciences. My thesis is that the study of disease has contributed much to the understanding of man as part of the social body, and therefore to the science of human ecology. An epigram published in the London *Spectator* shortly after the First World War defines succinctly some important aspects of medical sociology.

> Science finds out ingenious ways to kill
> Strong men, and keep alive the weak and ill—
> That these a sickly progeny may breed
> Too poor to tax, too numerous to feed.

The problems of human ecology, so well summarized in this epigram, are too complex to be dealt with in a single article, and I shall limit my discussion to a very narrow aspect of the field. Perhaps the easiest way to define my topic is to present it to you—very crudely—in the form of two alternatives. Can we hope that the knowledge gained by the study of disease will greatly lighten the burden of

medical care in the future? Or will new problems of disease endlessly arise and require ever increasing scientific and social efforts, making of medical Utopia a castle in the air that can exist only in the Erewhon of political Utopia?

It is my impression that the first alternative is the one most generally regarded as probable. In fact, it is clear that the lay and para-medical organizations established during the past fifty years to deal with problems of health are based on the optimistic assumption that, given enough time and financial resources, science can develop techniques to prevent or cure most diseases, and that only social and economic limitations will in the future stand in the way of ideal health. Anyone who has dealt with Congressional appropriation committees knows that the present flow of public money for medical research is based on the conviction that science will provide ways to eliminate disease. I wonder whether the attitude of fund-granting agencies would be as generous as now if they knew that it will continue to take all the running we can do to remain at the same place.

To state it bluntly, my personal view is that the burden of disease is not likely to decrease in the future, whatever the progress of medical research and whatever the skill of social organizations in applying new discoveries. While methods of control can and will be found for almost any given pathological state, I believe nevertheless that disease will remain a problem, and will merely change its manifestations according to social circumstances. Threats to health are inescapable accompaniments of life.

Health is an expression of fitness to the various factors of the total environment, and fitness is achieved through countless genotypic and phenotypic adaptations to these factors. Any change in the environment demands new adaptive reactions, and disease is the consequence of inadequacies in these adaptive responses. The more rapid and profound the environmental changes, the larger the number of individuals who cannot adapt to them rapidly enough to maintain an adequate state of fitness and who therefore develop some type of organic or psychotic disease. "It is changes that are chiefly responsible for diseases," wrote Hippocrates in Chapter XV of *Humours*, "especially the great changes, the violent alterations both in seasons and in other things." And he stated again in *Regimen in Acute Diseases*, "The chief causes of disease are the most violent changes in what concerns our constitutions and habits."

A perfect policy of public health could be conceived for colonies of social ants or bees, whose habits have become stabilized by instincts. Likewise, it would be possible to devise for a herd of cows an ideal system of husbandry with the proper combination of stables and pastures. But unless men become robots, their behavior and environment fully controllable and predictable, no formula can ever give them permanently the health and happiness symbolized by the contented cow. Free men will develop new urges, and these will give rise to new habits and new problems, which will require ever new solutions. New environmental factors are introduced by technological innovations, by the constant flux of tastes, habits, and mores, and by the profound disturbances that culture and ethics exert on the normal play of biological processes. It is because of this instability of the physical and social environment that the pattern of disease changes with each phase of civilization, and that medical research and medical services cannot be self-limiting. Science provides methods of control for the problems inherited from past generations, but it cannot prepare solutions for the specific problems of tomorrow because it does not know what these problems will be. Physicians and public health officials, like soldiers, are always equipped to fight the last war. Before proceeding further with this theme, however, it is only fair that I outline briefly the more optimistic attitude taken by many of the social philosophers and scientists in the course of history.

2

Some of the thinkers of classical Greece certainly believed that reasonable men could achieve the millennium of health by the exercise of wisdom. Witness the cult of Hygeia, which symbolized the faith that men could enjoy *mens sana in corpore sano* if they lived according to reason. Carrying this doctrine to its logical conclusion, Plato wrote that the need for many hospitals and doctors was the earmark of a bad city; there would be little use for them in his ideal Republic. In Imperial Rome, Tiberius asserted in a similar vein that anyone who consulted a doctor after the age of thirty was a fool for not having yet learned to regulate his life properly without outside help. In contrast, medieval Christianity had little faith in the possibility of creating a medical Paradise on earth. But after the Renaissance, Thomas More and all the utopists that followed him popularized imaginary states so well organized that their medical

needs could be foreseen and provided for just as certainly as their political and economic problems. Describing the ideal society he imagined on the moon, Cyrano de Bergerac asserted, "In every house there is a Physionome supported by the state, who is approximately what would be called among you a doctor, except that he only treats healthy people."[1]

The French Encyclopedists believed that all health problems could be solved by science, and Condorcet envisaged an era free from disease, in which old age and death would be infinitely postponed. Echoing this faith, Benjamin Franklin wrote to Joseph Priestley that "all diseases may by sure means be prevented or cured, not excepting that of old age, and our lives lengthened at pleasure even beyond the antediluvian standard." Continuing the traditions of the Enlightenment, Rudolph Virchow preached in his journal *Medizinische Reform* that misery was the breeder of disease, and that the key to the general improvement of health would be found in the improvement of social conditions. In one form or another, projections of Utopia have continued until our time. In James Hilton's *Lost Horizon,* the lamas living in Shangri-La, miles from corrupting influences, had mastered the secret of long life. In his book *My First Days in the White House,* Huey Long listed high on his program a plan to provide adequate medical care for the whole country – giving the job to the Mayo brothers!

Faith in the powers of man to eradicate disease had been greatly strengthened, of course, by the spectacular scientific achievements of the nineteenth century. In 1900 Hermann Biggs, then Commissioner of Health of New York State, adopted for his department the motto "Public Health is Purchasable. Within Natural Limitations Any Community Can Determine its Own Death Rate." In 1958 the same faith was repeatedly expressed on the occasion of the tenth anniversary of the World Health Organization. The authors of the WHO pamphlet *Ten Years of Health Progress* recognized, of course, that large problems remained to be solved, and that "as one disease is eradicated . . . others grow in importance," but Dr. Axel Hojer voiced their collective confidence that through the technique of scientific knowledge "man seems to have found out how to make his dreams of a paradise on earth come true." And still more recently, Dr. M. G. Candau, Director-General of WHO, affirmed:

> If the great advances gained in science and technology are put at the service of all the people of the world, our children will live in an age

from which most of the diseases our grandparents and parents took for granted will be banished. It may no longer be Utopian to envisage a new chapter in the history of medicine.

Medical scientists may be skeptical of social Utopias designed on the basis of political theories, but they rarely doubt that mankind would soon achieve the millennium if their own theories derived from "basic sciences" were put into practice.

The widespread conviction that health is purchasable, not only in limited areas but also on a world scale, seems to be substantiated by the advances made during the past half-century in the fields of nutrition and infection. In reality, however, it has not yet been shown that these achievements justify the wide extrapolations made from them. Indeed, there is overwhelming historical evidence that the evolution of diseases is influenced by many determining factors that at present are not, and may never become, amenable to social or medical control. The changes that have spontaneously occurred in the prevalence of various diseases during the past few centuries should serve as warning that it is unwise to predict the future from the short perspective of the past decades.

Granted the lack of precise information, it is clear nevertheless that many diseases have undergone ebbs and flows in their prevalence and severity. Plague invaded the Latin world during the Justinian era. Leprosy was prevalent in Western Europe until the sixteenth century. Plague again reached catastrophic proportions during the Renaissance. Several outbreaks of the sweating sicknesses terrorized England during Tudor times. Syphilis spread like wildfire shortly after 1500. Smallpox was the scourge of the seventeenth and eighteenth centuries. Tuberculosis, scarlet fever, diphtheria, measles, took over when smallpox began to recede. Today virus infections occupy the focus of attention in our medical communities. And long before viruses had become scientifically fashionable, pandemics of influenza at times added a note of unpredictability to the pattern of infection.

Awareness that diseases come and go for mysterious reasons is not new. Malthus had sensed the phenomenon when he wrote in 1803, "For my part, I feel not the slightest doubt that, if the introduction of the cow pox should exterminate the small pox we shall find a very perceptible difference in the increased mortality of some other disease." More recently, the historical and geographic aspects of the problem were documented by August Hirsch in his monumental

Handbook of Geographical and Historical Pathology.[2] The matter was interestingly discussed by Charles Anglada in *Etudes sur les maladies éteintes et sur les maladies nouvelles,* and by Maurice Nicolle in his famous book *Naissance, Vie, et Mort des Maladies Infectieuses* showing that such events are often governed by forces independent of conscious human intervention. Most explicit perhaps was the statement made in 1873 by William Parr in his letter to the Registrar General:

> The infectious diseases replace each other, and when one is rooted out it is apt to be replaced by others which ravage the human race indifferently whenever the conditions of health are wanting. They have this property in common with weeds and other forms of life, as one species recedes another advances.

I have selected infection to illustrate ebbs and flows in the prevalence of disease because of my greater familiarity with this field. But anyone with specialized knowledge could provide just as telling examples in other areas of medicine. With regard to nutrition, Lucretius was already aware of the problem when he wrote two thousand years ago, "In the old days lack of food gave languishing limbs to Lethe. On the contrary, today surfeit of things stifles us."

Coming now to our times, who could have dreamt a generation ago that hypervitaminoses would become a common form of nutritional disease in the Western world? That the cigaret industry and the use of x-rays would be held responsible for the increase in certain types of cancers? That the introduction of detergents and various synthetics would increase the incidence of allergies? That advances in chemotherapy and other therapeutic procedures would create a new staphylococcus pathology? That alcoholism would become widespread in the Western world? That patients with all forms of iatrogenic diseases would occupy such a large number of beds in the modern hospital?

We may take it for granted, I believe, that the pattern of disease will continue to change, and that as new types of pathology arise the solutions worked out for the problems of yesterday and of today will not be entirely applicable, if applicable at all, to the problems of tomorrow. For the sake of illustration, let me try to imagine a few of the problems that may be anticipated in the near future.

In the field of infectious diseases, we need not go far for examples because the future is already with us. While mortality from acute

bacterial infections is at an all-time low, chronic disorders of complex and ill-defined microbial etiology loom larger and larger on the horizon. In England chronic bronchitis is at present the second in causes of death and the largest cause of disability. It claimed 37,000 lives in 1951, and accounted for the certified loss of 26.6 million working days among the insured population. Chronic bronchitis illustrates the fact that air pollution and many other factors associated with life in urbanized and industrialized areas can give to otherwise trivial infections of the respiratory tract certain pathological characters that make them impervious to drug treatment and other methods of therapy.

As to the part to be played by viruses in the future, it need only be mentioned that the development of modern sanitation has begun to bring about a progressive shift of childhood diseases into adult life – with consequences that we are only now beginning to recognize. Even with regard to uncomplicated bacterial infections, the time is probably approaching when many of the chemotherapeutic agents presently in use will lose their effectiveness. The case of the staphylococcus is in everybody's mind; recent reports from Poland, England, Japan, and Denmark reveal that the gonococcus is becoming resistant to penicillin; and there is no doubt in my mind that the indiscriminate use of isoniazid, particularly in the underdeveloped parts of the world, spells the end of convenient drug control of tuberculosis within a very few decades. New drugs will of course be discovered, but it is unlikely that discovery will keep pace with need. In this regard, it seems relevant to quote here the conclusion reached by S. W. Simmons in a recent critical review of "The Current Status of Insecticide Resistance":

> It is evident that the extermination of vectors with residual insecticides is probably not feasible. We appear to be in an endless cycle of synthesizing, at an ever increasing cost, more and more insecticides to which vectors become more and more resistant. Thus, it seems we cannot go on forever relying on insecticides. A more final and permanent solution to the vector-borne diseases problem might lie in ecologic control.[3]

In contrast to infectious diseases, the field of nutrition would at first appear to hold few surprises for the future. There is reason to believe that nutritionists have identified most if not all the growth factors required by man, and that they can devise formulae satisfactory for all ages of life and for the various occupations. But the application of this knowledge is proving more difficult than its acqui-

sition. Both qualitatively and quantitatively, human requirements vary with the pattern of daily life; and habits as well as tastes change so fast that there is no time for orderly adjustments. Shakespeare made Nerissa say in *The Merchant of Venice*, "They are as sick that surfeit with too much as they that starve with nothing." Only now is it becoming a problem of general concern that what used to be a reasonable diet for a physically active man can be ill-balanced for the citizen wheel-borne in the modern world. Dietary habits that were adequate yesterday may come to constitute a national danger in the era of television and automation.

For the largest part of the world, of course, the real concern is not overnutrition, but rather shortage of food. And this is rapidly creating new problems of disease in poor countries where death rates have been cut by partial control of infection. Agricultural and industrial technology will no doubt provide new sources of carbohydrates, fats, proteins, amino acids, and vitamins in amounts sufficient to meet essential human needs. But it can be surmised also that the consumption of new kinds of food will bring in its train new types of medical problems. Nutritional disease can arise not only from qualitative or quantitative deficiencies, but also from toxic effects, which are often slow in manifesting themselves. For example, algae are much spoken of as economical synthesizers of foodstuffs, but there are several reports that the continued consumption of large amounts of algae by farm or laboratory animals has resulted in a hepatic toxicity of unknown mechanism. Other examples of hepatic toxicity that became apparent only after long-term use of certain new foodstuffs have been reported in a recent symposium on Human Requirements and their Fulfillment in Practice.[4] Scientific knowledge is not yet sufficient to replace the biological wisdom derived from the countless centuries during which mankind has engaged in the empirical trial of foodstuffs.

Many examples could be quoted to support the statement that technological advances carry with them threats to health revealed only by long experience, and often too late. These threats extend from mere inconveniences like allergies, to the delayed carcinogenetic effects exerted by radiation and by the various types of synthetic substances with which modern man increasingly comes into contact. Most industrial processes pollute the air, the water, and the rest of the environment with countless new chemicals and thereby prepare for the future various pathological disorders of types as yet unsus-

pected. Even air-conditioning may turn out to have physiological and pathological consequences that have not yet been recognized.

Changes in social patterns also will contribute their share of unpredictability to the health problems of the future. As our population grows and our natural resources decrease proportionally, there will be need for ever increasing organization, regulation, and even regimentation in our lives. It is hard to believe that the physiological and psychic effects of this transformation of collective life will all be favorable to physical and mental health. There is already evidence that the boredom engendered by automation is creating new forms of psychosis, and it will become increasingly difficult for society to manage a proper balance between its intake of tranquilizers and of energizers.

More dramatic in its implications, because so intimately involved in our system of ethics, is the fact that the very medical and social advances of which we are so justifiably proud are likely to create difficult if not insoluble problems for the generations to come. Speaking of our "load of mutations," H. J. Muller has repeatedly emphasized that, as medical science becomes more effective in permitting the survival of biologically defective individuals, there will be an increase in the frequency of detrimental genes allowed to accumulate in our communities. If this trend continues, in Professor Muller's words:

> Instead of people's time and energy being mainly spent in the struggle with external enemies of a primitive kind such as famine, climatic difficulties, and wild beasts, they would be devoted chiefly to the effort to live carefully, to spare and to prop up their own feeblenesses, to soothe their inner disharmonies and, in general, to doctor themselves as effectively as possible. For everyone would be an invalid, with his own special familial twists.[5]

In a recent essay on "The Control of Evolution in Man," Darlington expressed tersely the same thought:

> Those who were saved as children return to the same hospital with their children to be saved. In consequence, each generation of a stable society will become more dependent on medical treatment for its ability to survive and reproduce.[6]

It is misleading, of course, to speak of biological defectives without regard to the environment in which the individual lives and functions. Medical techniques can make up for genetic and other deficiencies that would be lethal in the wilderness; by controlling the

environment, and with the help of modern medical resources, man can live and function effectively in our world even though he is tuberculous, blind, diabetic, crippled, or psychopathic. But fitness bought at the cost of medical care has economic implications that have not yet been precisely determined. There is no doubt that a large percentage of individuals are now unable to pull their full weight in our communities, and we may assume that their numbers will continue to increase at an accelerated rate, precisely by reason of medical progress. Furthermore, it is also likely that the cost of medical care will continue to soar because each new discovery calls into use more specialized skills and expensive items. At the present time the cost of medical care in the United States amounts to more than 10 per cent of the national income. There is certainly a limit to the percentage of its resources that society can devote to the maintenance of its medical establishments; and a time may come when medical ethics will have to be reconsidered in the harsh light of economics.

The use of anticoagulents for the prevention of coronary thrombosis is a case in point. Although the value of this procedure has been established beyond doubt (see recent survey by the Medical Research Council in England), its application will be limited by its cost, for example by the labor involved in the determination of blood-clotting time. In other words, the medical justifications for the use of anticoagulents will need to be influenced by social criteria. Surgery for the repair of congenital heart defects provides another striking example, by reason of its exacting requirements in nursing care, hospital space, elaborate equipment, and technical skill. Finally, it must not be taken for granted that the power of science is limitless. After all, it is only during the past few decades that medical treatment has permitted the victims of genetic disabilities to survive and to reproduce on such a large scale. Should the trend continue, it is far from certain that therapy can keep pace with the problems that will have to be met to avoid biological extinction. Indeed, I would be surprised if the medical geneticist of the future did not rate the sociological aspects of his science as more important than its contribution to biochemistry.

3

The political Utopias devised by Plato, Thomas More, and their imitators have no chance of success because they are based on a

static view of the world and of men. H. G. Wells defined the problem clearly in his book *A Modern Utopia:*

> The Utopia of a modern dreamer must needs differ in one fundamental aspect from the Nowheres and Utopias men planned before Darwin quickened the thought of the world. Those were all perfect and static forces, a balance of happiness won for ever against the forces of unrest and disorder that inhere in things. But the Modern Utopia must be not static but kinetic, must shape not as a permanent state but as a hopeful stage.[7]

Similarly, it is impossible to acquire in advance all the specialized knowledge and techniques that will be required to deal with the diseases of the future. What may be worth asking, however, is whether medical science can help the individual and society to develop a greater ability to meet successfully the unpredictable problems of tomorrow. This is an ill-defined task for which there is hardly any background of knowledge. Traditionally, medicine is concerned with retarding death and also with preventing pain and minimizing effort. Its achievements in this field have added greatly to the duration, safety, and charm of individual existence. While scientific medicine has continued to emphasize the detailed study of particular diseases and specific remedies, it has placed less emphasis on the nonspecific mechanisms by which the body and soul deal with the constant and multifarious threats to survival. The question is whether it is possible to increase the ability of the individual and of the social body to meet the stresses and strains of adversity. In this regard it may be worth considering that preoccupation with the avoidance of threats and dangers does not have the creative quality of goal-seeking. It is at best a negative attitude, one that does not contribute to growth, physical or mental. In our obsession with comfort and security, we have given little heed to the future, and this negligence may be fatal to society and indeed to the race.

Whatever the theories of physicians, laboratory scientists, and sociologists, it is of course society that must decide on the types of threats it is most anxious to avoid and on the kind of health it wants — whether it prizes security more than adventure, whether it is willing to jeopardize the future for the sake of present-day comfort. But this decision might be and should be influenced by knowledge derived from a study of the manner in which different ways of life can affect the future fate of the individual and of society. Although this knowledge does not yet exist, a few general remarks appear justified.

It is a matter of common experience that, while man's physical and mental resources cannot develop to the full under conditions of extreme adversity, nevertheless a certain amount of stress, strain, and risk seems essential to the full development of the individual. Normal healthy human beings have long known, and physiologists are beginning to rediscover, that too low a level of sensory stimulation may lead to psychotic disorders, and that man functions best when a sufficient number of his neurons are active. Analogous considerations seem to be valid for the lower levels of biological functions, and two recent studies illustrate that at least some of the mechanisms involved in training and in adaptability are not beyond experimental analysis.

It has been shown by Dr. Curt P. Richter and his associates that the domesticated laboratory rat differs from its wild ancestor, the Norway rat, in many anatomic and physiologic characters that can be measured by objective tests. As a result of selection and of life in the sheltered environment of the laboratory, the domesticated rat has lost most of the ability of its wild ancestor to provide for itself, to fight, and to resist fatigue as well as toxic substances and microbial diseases. The domesticated rat has become less aggressive in behavior but also less able to meet successfully the strains and stresses of life, and therefore it could hardly survive competition in the free state. As a result of domestication, in Dr. Richter's words:

> (1) the adrenal glands, the organs most involved in reactions to stress and fatigue, and in providing protection from a number of diseases, have become smaller, less effective . . . (2) the thyroid—the organ that helps to regulate metabolism, has become less active . . . (3) the gonads, the organs responsible for sex activity and fertility, develop earlier, function with greater regularity, bring about a much greater fertility. . . . The finding of a smaller weight of the brain and a greater susceptibility to audiogenic and other types of fits, would indicate that the brain likewise has become less effective.[8]

While some of these changes may be phenotypic, it is probable that most of them are the expression of mutations selected by life in the laboratory. But whatever their mechanism, the effects of domestication on the wild rat are not without relevance to the future of mankind. Human societies made up of well-domesticated citizens, comfort-loving and submissive, may not be the ones most likely to survive.

The study of so-called germ-free animals has revealed other aspects of this problem. Animals born and raised in an environment free of

detectable microorganisms can grow to a normal size and are capable of reproducing themselves for several generations, but they exhibit extraordinary susceptibility to infection, even to the most common types of microorganisms that would be innocuous for animals raised in a normal, exposed environment. Furthermore, germ-free animals produce only small amounts of lymphoid tissue, and their plasma is extremely low in gamma globulin – deficiencies that may be of little consequence in the protected environment of the germ-free chamber, but that become fatal under normal conditions of life.

These types of experimental situations illustrate the fact that a sheltered life alters in many ways the ability of the organism to cope with the stresses of life. "Let a man either avoid the occasion altogether, or put himself often to it, that he may be little moved with it," Bacon wrote in his essay *Of Nature in Men.* While Bacon's aphorism is a picturesque statement of an important sociomedical problem, the solution that it offers hardly fits the modern world. Man cannot "put himself often to threats" the nature of which he cannot anticipate. But he can perhaps cultivate the biological mechanisms that will permit him to respond effectively when the time of danger comes.

4

Thus, a type of knowledge that bears on social philosophy is slowly emerging from preoccupations with medical problems. After a semifacetious debate held in London on 17 November 1952, the Hunterian Society voted 59 to 47 "that the continued advance in medicine will produce more problems than it solves." In reality, most of the new problems continuously arising are not the products of medical advances, but manifestations of the fact that our society becomes more complex as it grows in size and age. We cannot escape these problems, but we should give more thought to the long-range effects of the solutions that we devise to meet them.

We must have the courage to discuss the wisdom of retaining individual longevity as the dominant criterion of social and medical ethics. We must be prepared to recognize that an excessive concern with security, with comfort, and with avoidance of pain and of effort, has dangerous economic and biological implications – that such concern may, in fact, amount to social and racial suicide. I realize that any attempt to deal with these problems will involve painful conflicts with personal interests and with religious and moral convictions. Yet we have to formulate the problems in a forthright manner if we are to

find their solutions. Unless we discover methods for producing a higher level of adaptive power in the individual and for preventing genetic deterioration of the race, the likely alternative is that more and more in the future we shall have to run frantically from one protective and palliative measure to another, trying to lengthen life at the cost of sacrificing its wholeness and many of its values.

Before closing, I must acknowledge that I have never taken care of the sick and am not a physician – a fact that has prevented me from apprehending with all their compelling force many of the human and practical aspects of medicine. Though fully aware of my lack of judgment arising from these deficiencies, I cannot refrain from quoting here a few lines from G. K. Chesterton, brought to my attention by a humane physician who is also a scientist:

> The mistake of all that medical talk lies in the very fact that it connects the idea of health with the idea of care. What has health to do with care? Health has to do with carelessness. In special and abnormal cases it is necessary to have care. . . . If we are doctors we are speaking to exceptionally sick men, and they ought to be told to be careful. But when we are sociologists we are addressing the normal, we are addressing humanity. And humanity ought to be told to be recklessness itself. For all the fundamental functions of a healthy man emphatically ought not to be performed with precaution or for precaution.[9]

Chesterton was neither a scientist nor a physician, and as a sociologist he was prone to substitute brilliant paradox for logic and knowledge. Yet it seems to me that his flippant remarks help to quicken attention to an aspect of medicine that bids fair to become of increasing social importance in the future. Medical advances do not arise in a social vacuum. They are products of the sparks between the scientific knowledge of the time and the demands of the community. But what the community demands is determined to a large extent by publicity, apparent or hidden – in this case by the implied promises of medical science. We must beware lest we give the illusion that health will be a birthright for all in medical Utopia, or a state to be reached passively from effortless directives given by physicians or from drugs bought at the corner store. In the real world of the future, as in the past, health will depend on a creative way of life, on the manner in which men respond to the unpredictable challenges that continue to arise from an ever changing environment.

The study of specific pathological problems requires the use of laboratory techniques and contributes to the advancement of labora-

tory knowledge. But the field of medicine transcends this kind of knowledge because it deals with man as a spiritual being and also with the future of the human race. Medical science is concerned not only with the control of individual diseases, but also with the long-range effects of its products on the total performance and happiness of the individual, on the social problems of the community, and on the adaptive powers of the race. Unless medical scientists are willing to take a long-range view of the consequences of their activities, some day they may have to confess like Captain Ahab in *Moby Dick*, "All my means are sane . . . my object mad." They may come to know the anguish that atomic physicists experienced as they watched the tragic effects of their scientific triumphs. Because medicine is an aspect of social technology, its ethics and its goals are the products of the interplay between scientific understanding and human aspirations.

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Population Problems and the Control of Fertility

HUDSON HOAGLAND

The Decline in the Death Rate

KNOWLEDGE of itself is ethically neutral, but the uses to which it is put may have far-reaching consequences for good and evil. Major contributions of science of great significance often carry with them dangerous and quite unforeseen consequences. Examples of such ambivalences readily come to mind.

One of the most interesting examples is posed by the advances in the medical sciences in the last hundred years, which have brought a remarkable alleviation of human suffering and extension of the life span. In the Greco-Roman world of some two thousand years ago, the life expectancy of an infant at birth was only about 25 years, and in general it was even lower in Europe during the Middle Ages. At about 1850, the life expectancy in Western Europe and the United States had risen to only 40 years. But then a remarkable change occurred. In the past hundred years, life expectancy has climbed steadily so that it is now about 70 years in the United States —a gain of 30 years in the past century compared to 15 years in the previous twenty centuries.

Maurice Tainter[1] has given a good account of these changes and the major factors involved. The sudden increase of the life span, beginning about 1860 (see Figure 1) was the result primarily of the introduction of experimental procedures in physiology involving the study of living laboratory animals under controlled conditions. The name of the French physiologist Claude Bernard stands out above others here. A brilliant student of Magendie, he was a friend of Pasteur, who was in turn greatly influenced by him. Bernard's

The first section of this paper was read by the author on 14 January 1959 at the American Academy of Arts and Sciences. The second section summarizes the investigations described at that meeting by Dr. Gregory Pincus of the Worcester Foundation for Experimental Biology.

impact on professional biologists and medical men—for example, through his *Introduction to Experimental Medicine* (1865)—may be compared to that of Darwin.

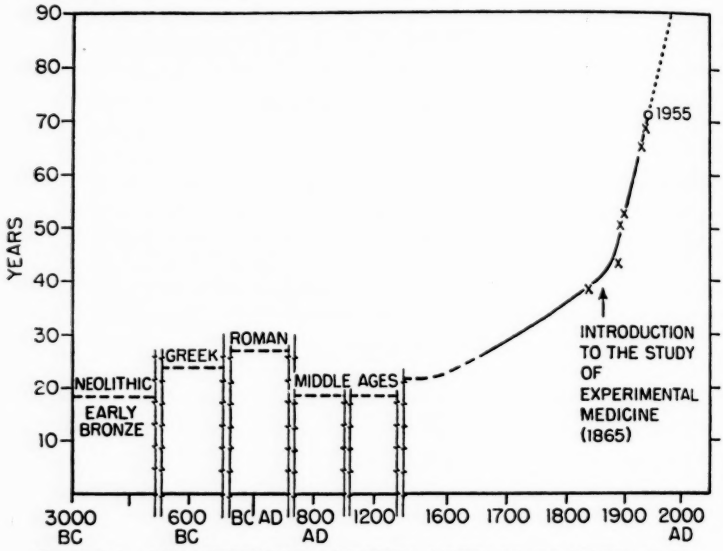

FIGURE 1. LIFE EXPECTANCY AT BIRTH (AVERAGE OF WHITE MALE AND FEMALE POPULATION). Based on Maurice L. Tainter, op. cit.

A factor of comparable importance in advancing the medical sciences was the accumulation of knowledge about the carbon compounds, beginning early in the nineteenth century. The great development of organic chemistry and of its later offshoot biochemistry in the twentieth century has revolutionized the theory and practice of medicine. Starting with Pasteur, the bacteriological sciences and the sciences of immunology and sanitary practices have rapidly brought many infectious diseases under control. Within recent decades sulfa drugs, antibiotics, and insecticides have greatly extended this conquest through the happy conjunction of work of microbiologists, organic chemists, physiologists, biochemists, and clinicians. Thus, for example, from 1937 to 1955, a span of eighteen years, the over-all death rate in the United States dropped 18 per cent. In the eleven years from 1944 to 1955 the death rate from rheumatic fever dropped 77 per cent; that from pneumonia, 37 per cent; that from influenza,

90 per cent; that from maternal deaths, 77 per cent. The death rate from kidney diseases fell 65 per cent, and infant mortality rates declined 33 per cent.[2]

The result is that today the United States and Western Europe have relatively older populations increasingly susceptible to metabolic disorders more characteristic of the aged. We are told that one in three die of cardiovascular diseases, and one in five of cancer. It has also been pointed out that one out of one of us will die. Those who have been spared the bacteria and viruses have other unpleasant things in store, and consequently much of the medical research of today is directed against metabolic diseases and degenerative processes, which will further extend life expectancy.

The Population Expansion

The declining death rate throughout the world has resulted in an explosive increase in population. The United Nations (see Figure 2) estimates that the world population, now over 2.7 billion, is currently increasing by 40 million per year, or about 100,000 per day.[3] Thus the population is doubling about every forty years. China has a present population of about 650 million, and a current growth rate of over 2 per cent per annum. At this rate it will

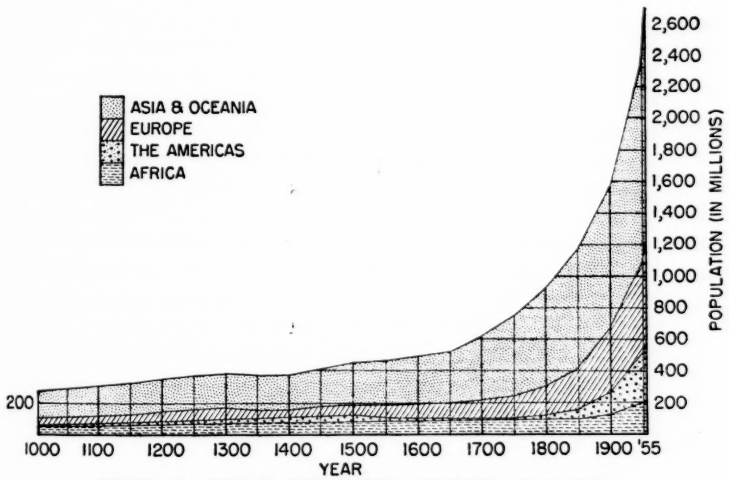

FIGURE 2. WORLD POPULATION GROWTH, 1000-1955

reach 5 billion a hundred years from now. This indicates about twice the present population of the world for one country alone. So great is the present expansion of population that it is estimated that of all the people who have ever lived, 20 per cent (one-fifth) are alive today. Murray Luck in a well-documented paper has recently written that "to judge from the trends of the past 25 years a world population of 9 billion and a U.S. population of 600 million by the year 2050 are almost inevitable."[4] This appears to be a conservative estimate. Kingsley Davis[5] has estimated a world population of 13 billion by 2050.

The effects of decreasing death rates are most pronounced in economically underdeveloped countries. The introduction of sanitation and medical and prenatal care rapidly lowers the death rate, while the birth rate holds constant or increases, at least for a few generations. The population of Egypt has thus increased from 7 to 23 million in the last two generations. Primarily by the use of insecticides and the elimination of malaria, Ceylon recently cut its death rate 70 per cent in ten years. In Malaya the birth rate has been constant since World War II, while the death rate dropped approximately 40 per cent between 1946 and 1954. These figures are typical of many Asian, African, and Latin-American countries.[6, 7]

The Consequences of the Rapid Expansion of Population

In contrast to countries like the United States, in which improved control of infant mortality is an accomplishment of past generations, the present population gains in underdeveloped countries are maximal among the young—in infants and children. Thus in Algeria, according to Kingsley Davis,[8] 52 per cent of the Moslems are less than 20 years of age, in contrast to only 37 per cent of people less than 20 in the United States and 31 per cent less than 20 years of age in France. Opportunities for jobs and education for these waves of youth are inadequate, and they can therefore fall prey the more easily to demagogues and revolutionary leaders. Under these circumstances, aggressive nationalism becomes especially appealing; if the leaders are incapable of sound economic statesmanship and are ambitious for power, they can play faction against faction and hate against hate as in the Middle East today. Here lies one of the most dangerous consequences of the rapid expansion of population.

In time, usually a matter of generations, following a population expansion resulting from an increased life expectancy in a region, the birth rate may be expected to fall slowly as primitive agricultural economy, requiring many sons for farming, shifts to industrial economy, and as the standards of living and education improve. But with the present unprecedented increase in populations, the accumulation of capital and credits for modernization is exceedingly difficult, and the lack of freely available areas for the expansion of peoples into new territories makes the situation grim indeed. It has been estimated that on the present American standard of living, this planet could support a population of only 900 million, or about a third of the present world population. According to J. G. Harrer,[9] the American people, constituting only 6 per cent of the world's population, consume 3100 calories per capita daily, while 55 per cent of the world's population are underfed on a daily consumption of 2200 calories per capita. Leallyn Clapp[10] has pointed out that the United States consumes eighteen tons of the world's resources per capita per year (food, metals, building materials, fuel) in contrast to two tons per person per year for the rest of the Free World. The conservative prediction of nine billion for a world population a century hence will be ten times the number now estimated to be supportable in terms of the current American standard of living. Only by a radical scaling down of ambitions for a decent standard of living, or by discoveries of quite new and cheap forms of food and sources of power, can the world maintain its ever increasing population burden, and at that, only within circumscribed limits. Unchecked increases in population seem clearly a source of misery and a potential cause of wars. It is indeed ironical that this situation has resulted primarily from the success of scientific, medical, and public-health advances, which in themselves are potentially beneficial to every individual.

Murray Luck has reviewed the possibility of feeding 9 billion people in the year 2050. He thinks it will be barely possible, although inequities in distribution will be accentuated. He points out that by bringing under control—at great expense—vast arable land areas not now utilized for agricultural purposes, and with the application of known mechanical techniques for producing food, one may hope for a doubling of world food production as a goal for feeding a tripled population. In addition, he believes that much

of our essential food, especially some of the indispensable amino acids, will have to be produced in factories. There is little likelihood that we can long continue to enjoy the luxury of food from domestic animals; the production of animal food for human consumption is an inefficient process, requiring great quantities of food for the animals in order to produce relatively small amounts of protein and fats for human consumption. About 50 per cent of the crops grown are used by animals. Only 3 to 5 per cent of the food that animals eat is converted to food for man. Synthetic amino acids would thus have to substitute for animal-protein amino acids to a large degree. In addition, protein material extracted from leaves and grown from algae, such as *Chlorella* in fresh-water ponds, might come to supply much of the needed food protein. Luck writes:

> It is also reasonably certain that our society will become so complex because of the evolving patterns in industry, the pressure of high population density, and the inevitable increase of controls of all sorts designed to husband our diminishing resources, and to keep us at peace with our neighbors, that governments will become more and more pervasive and domineering; the precious freedoms of the individual will diminish.[11]

Food production has been increasing substantially in recent years, but the population has increased more rapidly. According to the United Nations Food and Agriculture Organization,[12] even though the world's production of food as of 1951 had increased by 9 per cent since 1934-1938, the population had increased by 12 per cent. As a result, the mean world per capita calorie consumption dropped from 2380 calories per day to 2260 calories, and hunger and food shortages increased in many areas. To meet the rapidly increasing demands for food, vast sums will have to be expended in land reclamation and the prevention of further erosion, in the manufacture of fertilizers, and in the husbanding of nitrogen- and phosphorus-containing wastes. Fisheries will have to be greatly extended, especially in the southern hemisphere, and much of the food supply will have to be harvested from the ocean and from fresh water via the cultivation of bacteria, yeasts, and photosynthetic algae.

There are some who take a much more optimistic view of the potentialities of science and technology to keep up adequately with our burgeoning populations. But even with all techniques known or predicted at present, the outlook for feeding 9 to 13

billion people a century hence is most serious. Only in a closely interlocking industrial and agricultural community would it seem at all possible. A war with modern weapons would so disintegrate such a complex society that effective food supply and distribution would become impossible, and a large fraction of those escaping the bombs might perish from hunger.

Measures to Decrease the Birth Rate

There is one clear solution to the problem resulting from decreased death rates; a decrease in the birth rates. In short, I believe that birth control is not only desirable but morally necessary if men are to live in civilized societies and not destroy each other in competition for resources. Fortunately, the governments of some Asian countries are alert to the danger. Thus India has built into its second five-year plan provisions for research into population control. The Province of Kerala has offered approximately five dollars to each of its male citizens who submits to sterilization. On 16 February 1959 *The New York Times* reported that the Indian government had decided to provide facilities in all hospitals to carry out sterilization operations for all who wished to restrict the size of their families. At first these facilities were to be available only for the sterilization of males. Several years ago Mao Tse-tung stated that China's population would be stabilized at 600 million and birth-control clinics were established extensively in that country. Recently, however, this sensible policy has been reversed, amid propaganda claims that China should and could support double its present population. The Japanese have succeeded in checking their accelerating population growth since the war by the drastic use of legalized abortion clinics.[13] In 1920 the population of Japan was 51 million: in 1957 it had increased to 91 million, in a country the size of Montana. In 1948, the annual birth rate was 34 per thousand and the death rate 12 per thousand. This would have doubled the population in thirty-two years. As a result, in 1948, the Japanese Diet legalized abortion, and established 800 health centers and 30,000 birth-control guidance offices. As a consequence, the birth rate fell to 19.4 per thousand in 1955, cutting the rate of population growth almost in half and bringing it below that of the United States.

To counteract the consequence of what has been referred to as the "population bomb," greatly improved methods of contraception

are needed, for current methods are unreliable, inconvenient, and expensive. For some years, two sure forms of surgical contraception have been available. But in women, salpingectomy (cutting ovarian tubes) is a major operation, expensive and irreversible, one not used to prevent childbearing except under unusual medical circumstances. On the other hand, vasectomy in men (cutting the spermatic duct) can be performed under local anesthesia by a physician in half an hour in his office. This procedure sterilizes the male without in any way affecting his sexual potency or the sex act. But the irreversible nature of this process and its confusion with castration in the lay mind, together with social and religious taboos, have precluded its use to any significant degree by men who wish to prevent further pregnancies on the part of their wives. What is most needed is a contraceptive that can be taken by mouth so as to prevent pregnancy during the time of its action in the body. Such a substance must produce no untoward side effects and must not block future normal pregnancies after the withdrawal of medication. It must also be very inexpensive if it is to be widely used in underdeveloped countries, where its need is most urgent.

Fertility Control With Oral Medication

Valuable work on oral contraceptives has been carried out over the past five years at The Worcester Foundation for Experimental Biology under the direction of my colleague, Dr. Gregory Pincus, who, with Dr. Min-Chueh Chang of our staff, has done much basic work in the field of mammalian reproduction. Pincus and Chang, with the clinical collaboration of Dr. John Rock and Dr. Ramón García of the Harvard Medical School and the Brookline Free Hospital for Women, have demonstrated several synthetic steroid hormonelike substances of great promise, which can be used as oral contraceptives. The credit should go to Dr. Pincus for the discovery that the group of synthetic steroids of the 19-nor type block ovulation and are therefore effective as oral contraceptives.

Fertility-preventing procedures may operate on different parts of the complex mammalian reproductive system. Conventional methods are aimed at preventing the sperm from reaching the egg. These procedures have psychological drawbacks and may also at times be ineffective. Chemical agents may be considered, whose function is to prevent ovulation or to prevent the implantation of the fertilized egg, or to inactivate the sperm before it can reach the

egg in the tubes or to cause abortion of the very early embryo soon after implantation in the uterine wall. The discovery of Pincus and his collaborators falls into the first classification; it involves the use of substances that prevent the release of eggs from the ovary and so prevents pregnancy.

In the human female, in the years between puberty and the menopause, there normally occurs the release of an egg about every twenty-eight days from one of the two ovaries. The egg migrates down the Fallopian tube into the uterus, which has been prepared to receive it by the action of hormones. If the egg is fertilized by meeting a sperm, it becomes implanted in the uterine wall, and pregnancy ensues. If fertilization does not occur, the egg degenerates and is discharged along with the prepared lining of the uterus in the form of the menses. If fertilization and implantation of the ovum take place, a biochemical signal in the form of a steroid hormone called progesterone is released, which prevents the further discharge of eggs from the ovary at the time of subsequent ovulation periods. It does this by suppressing the release of a gonadotrophic hormone secreted by the pituitary gland located at the base of the brain. Several pituitary gonadotrophins in the form of specific protein hormones regulate the normal sex cycle and also control pregnancy and lactation. They regulate the female sex cycle by controlling the release of several forms of steroid sex hormones from the ovary and from the egg follicle. Suppression of the pituitary by progesterone suppresses the action of ovarian estrogens involved in menstruation and ovulation. Were this not to happen, further pregnancies might occur, with disastrous consequences during the development of the earlier embryo. One may say that during the period of pregnancy progesterone acts as nature's own contraceptive.

Since progesterone endogenously released during pregnancy inhibits ovulation, one might expect that its injection would have a similar blocking action. Makepeace *et al.*[14] in 1937 demonstrated that progesterone when injected into rabbits inhibited ovulation.* In 1953, this was confirmed by Pincus and Chang,[15] who showed in addition a

* Menstrual cycles are characteristic only of females of the higher primates, and differ from the oestrous cycles of other animals. But without digressing into comparative physiology, it is sufficient for our purposes to point out that both menstrual and oestrus cycles are regulated by a similar interplay of protein hormones from the pituitary gland and of steroid hormones from ovary and egg follicles.

quantitative relationship between the duration of inhibition and the amount of progesterone injected. Substances that have progesterone-like effects on the lining of the uterus in animals or other progestational activities are referred to as progestins. Pincus and Chang also found that an orally administered progestin (17-α-ethynyl testosterone) was effective in blocking ovulation; 17-α-methyl progesterone was effective when it was injected, but not when administered orally. Eleven other progesterone derivatives were found to be ineffective as ovulation inhibitors. Further work by these investigators showed similar effects of these three active steroids in blocking fertility in the rat.

Encouraged by these results, Pincus and Chang proceeded to test the effect of a still larger number of steroid substances on the fertility of female rabbits and rats. In the course of examining some sixty compounds, they investigated a class of steroid substances known as the 19-nor steroids, so named because they lack the usual methyl group on the number 19 carbon of the steroid skeleton. These are synthetic steroids with progestational activity.[16] Three of these 19-nor progestins (referred to here as I, II, and III)* were selected by Pincus and Chang[17,18] because they found them to have strong antifertility properties in very small concentration. A summary of the findings[19,20] demonstrates that these substances when given orally to rabbits and rats are much more effective in very low doses than is progesterone itself, not only in regard to the inhibition of ovulation but also in other indices of progestational activities on tissues of the animals. It was found that in the rabbit the inhibition of ovulation induced by the progestins could easily be overcome by the administration of pituitary gonadotrophin to the ovulation-blocked female. Moreover, following the withdrawal of the steroid medication, normal reproductive function resumes.[21] This was true both for rabbits and for rats, conception taking place following regular coitus in all cases 25 to 28 days after the cessation of medication.

The Inhibition of Ovulation in Women

As a result of the findings with animals, investigations were made of the comparative effects of progesterone and of these three 19-nor

* These substances are: I, norethesterone or 17-α-ethynyl-19-nortestosterone; II, norethynodrel or 17-α-ethinylestra-(5,10)-eneolone; III, norethylsterone or 17-α-ethyl-19-nortestosterone. Their trade names are: I, Norlutin; II, Enovid; and III, Nilevar.

steroids on the inhibition of ovulation in women. In animals it had been found that five to twenty times more progesterone was required when administered by mouth than when given by injection to block ovulation. Normally ovulating and menstruating women served as subjects, and the following procedure of medication was carried out in collaboration with Dr. Rock and Dr. García. Following a period of control observations of each individual's cycle, 300 milligrams of progesterone were taken orally in one series of studies, and in another series 10-milligram tablets of the 19-nor steroids were used. These hormones were taken daily from the fifth through the twenty-fourth day of each menstrual cycle. This span of medication covers the possible range of ovulation time, and also assures bleeding comparable to normal menstruation following the withdrawal of the progesterone or of the synthetic progestins. Thus the subject could experience normal menstrual periods under this procedure, but if the medication were effective she would not ovulate. In all of the early tests daily records were obtained of two indices of ovulation. These were basal body temperature measurements and vaginal smears. In addition, an endometrial biopsy test for ovulation was made on one day between the nineteenth and twenty-first days of the cycle. These days were chosen to correspond to the maximum expected activity of the progesterone released from the corpus luteum. Determinations of urinary concentration of creatinine, pregnanediol (a metabolite of progesterone) and 17-ketosteroid were made on forty-eight-hour urine samples collected during days 19 to 21. From endometrial biopsies, vaginal smears, and temperature data, gynecologists can determine with reasonable assurance whether or not ovulation has occurred. Pregnanediol reflects the possible suppression of a gonadotrophic release of eggs via their corpora lutea and the consequent suppression of endogenous progesterone. The 17-ketosteroid determinations were used primarily as an index of adrenocortical function, since for the most part they are metabolites of adrenocortical steroid hormones.

The first investigation consisted of a study of thirty subjects given daily doses of 300 milligrams of progesterone itself for thirty control and sixty medication cycles.[22] Ovulation was found to be inhibited from 75 to 80 per cent in the first cycle of progesterone medication, from 75 to 100 per cent in the second cycle, and from 87.5 to 100 per cent in the third cycle. Some significant shortening in the mean cycle lengths during this medication period were found as a result of early

menstrual bleeding in about 30 per cent of the cases taking progesterone.

As a result of the findings with animals of the superior oral activity of the 19-nor steroids, they were next employed in a medication series similar to that described for progesterone, involving fifty women (forty women received either I or II and ten received III). Ten-milligram daily doses of the substances were administered; no alterations occurred in the mean cycle length with the 19-nor steroids. Ovulation was inhibited in from 88 to 100 per cent of the cycles by any of the criteria studied. No significant change in 17-ketosteroid excretion was seen, but there was a marked drop in pregnanediol output, suggesting an absence of corpora lutea. Observations indicated that, following medication with these compounds in the first treatment cycle, there may be a delay of several days in the resumption of normal cyclical activities of the ovary. No conceptions occurred in the fifty women during the 125 medication cycles, although normal sexual activities continued. Seven of the women became pregnant within five months after the cessation of treatment.[23]

The most extensive and revealing investigations have been carried out in Puerto Rico and Haiti, under the direction of Dr. Pincus, using the 19-nor steroid II (norethynodrel) in Enovid tablets.* These studies have involved investigations of 830 women followed for 8133 menstrual cycles, equivalent to 635 woman-years. Many of these women have taken the 19-nor steroid in 10-milligram doses from the fifth to the twenty-fifth day of the menstrual cycle for a period of over three years.[24] Each subject was given a bottle containing twenty tablets, with instructions to take one each day from the fifth through the twenty-fourth days of her menstrual cycle. Social workers visited the subjects and recorded any occasions on which tablet-taking was missed as checked by the count of pills in the bottle. This study was carried out by four separate groups in the Caribbean area—three in Puerto Rico and one in Haiti. All four groups reported similar effects of the medication. The important finding has been that norethynodrel is 100 per cent effective if taken according to the prescribed regimen.

* Each Enovid tablet contains, in addition to 10 milligrams of norethynodrel, 0.15 milligrams of an estrogen (ethynyl estradiol 3-methyl ether). This estrogen supplement was added for the adequate maintenance of the endometrium, thus preventing premature menstrual bleeding, since this progestin by itself was sometimes, in some women, inadequate for this purpose.

Study of Secondary Effects

The contraceptive effects of the tablets do not diminish when medication is continued over long-time spans. The menstrual cycles of women taking these tablets are of normal length, and are actually more regular than those not taking the tablets, unless tablet-taking is missed. When tablet-taking is missed, a certain amount of menstrual bleeding may be precipitated upon withdrawal of the medication, and this may be blocked by remedication, thus lengthening the cycles. A certain amount of premature menstrual bleeding was found to occur in a small percentage of medication cycles, despite regular tablet-taking. This was highest in the first cycle of medication, and it declined progressively to very low levels of occurrence by the fifth cycle. In only 0.7 to 3.2 per cent of the medication cycles did menstruation fail to occur promptly after withdrawal of the tablets.

In questioning the total group of subjects, the great majority reported no change in the quantity of menstrual flow during the medication cycles. In some cases there was a decrease, and the frequency of this decrease of flow was the same in the early as in the late medication cycles. Painful menstruation, normally characteristic of a considerable number of women, was considerably decreased during the periods of medication. A certain percentage complained of nausea, dizziness, and headache. Such reactions ranged from 6.3 per cent for one of the Caribbean groups to 18.3 per cent for another. The reactions were highest in the first medication cycle, declining thereafter to much lower levels—to zero by the twentieth cycle in the Puerto Rican group showing the early mean of 6.3 per cent, and to 9.0 per cent in the group showing the early incidence of 18.3 per cent.

A study was performed on those reporting these complaints, in which the effects of placebos and medication were compared.* The occurrence of the side reaction was a little greater for the group on the medication, but the differences were not statistically significant. The absence of admonition to the subjects about the possibility of the occurrence of reactions also markedly decreased the side effects. It was concluded that these side reactions are probably psychogenic in origin.

* This was a "double-blind" study, in that neither the subject nor the observer knew whether the pill was a placebo or medication, since it was administered according to a code by a third person.

Some gains in weight were reported in the majority of women taking the medication. In this connection it should be borne in mind that, compared to women in the United States, the normal calorie consumption of most of these Puerto Rican and Haitian subjects is relatively low. When questioned, about a third of the subjects reported increased well-being, and less than 10 per cent reported decreased well-being.

Most of the subjects reported no change in libido during medication, but an examination of reports of the frequency of coitus indicated an increase in frequency in the first twelve medication cycles, and a sustainment of these increased frequencies in later cycles. Such a result might be expected to follow from a decrease in the fear of pregnancy. Gynecological examinations carried out on a number of the women at different periods of the medication cycles indicated no pathological changes. There seemed to be a mild growth stimulus to the uterus in a few cases and improvement in vaginal tone. Liver-function tests were made on 148 subjects in various cycles of medication and were compared to 20 unmedicated controls. The data indicated an entirely normal liver function following the medication.

These findings fully confirmed the contraceptive effect of norethynodrel reported in earlier studies. The normal pregnancy rate without medication established for women of the mean age range of 28 years (an age range corresponding to that of the 830 women of the study) is one pregnancy per 1.48 woman-years. But in these experiments—including those women who did not take the medication faithfully—the over-all rate was one pregnancy per 37 woman-years. This is equivalent to a 96 per cent reduction in the normal premedication pregnancy rate. Furthermore, if in this comparison one eliminates the times during which the women would have been pregnant in the premedication years, one finds a 98.9 per cent reduction in pregnancy rate.

Data were carefully kept of the number of tablets missed by the women. The group of faithful tablet-takers (87.5 per cent of the 830 women, who missed none of the twenty days per cycle for their medication periods) showed only one case of pregnancy, and in this case it was not certain that tablets had not been missed. The pregnancy rate was thus essentially zero for those following the regimen. For those who missed taking one to five tablets (9.4 per cent of the total), there were five pregnancies, and for those missing six to nineteen tablets (3.6 per cent of the total), there were eleven pregnancies. An

analysis of the frequency with which medication was missed during the 8133 cycles indicated a tendency to miss tablet-taking more frequently in the earlier cycles, with correspondingly higher frequencies of conception.

Fertility subsequent to the withdrawal of medication was determined by follow-up data on 86 subjects. Pregnancies developed in 83 per cent of those failing to use other means of contraception in a mean exposure period of 6.1 months, and in 15 per cent of those regularly using other contraceptives over a mean exposure period of 52 months. The mean pregnancy rate for those not using contraceptives was 193 per 100 exposure years, and for the latter group—i. e., those using conventional contraceptives—it was 37 per 100 exposure years. The value of 193 pregnancies per 100 exposure years is of the same magnitude as the value of 242 pregnancies per 100 exposure years previously found in a group of Puerto Rican women who had used no contraceptives. It is thus clear that the medication had no inhibiting effect on subsequent pregnancies throughout the twenty cycles for those observed in this follow-up study.

An investigation was also made of the effects of administering one-half and one-quarter the daily 10-milligram dosages of medication. No pregnancies were reported in the subjects taking these lower doses. Adequate sustainment of menstrual cyclic activity was fully maintained on a 5-milligram dose, but a tendency for early menstrual bleeding in some patients occurred on the 2.5-milligram dose.

Data have been obtained on sectioned ovaries of a group of nine women who took the medication for periods of two to twenty months (unpublished). The ovaries were removed for reasons that had nothing to do with the medication, and the operations were planned before the women engaged in the experiment. The ovaries were compared to those obtained from eight women who had not received medication. The ovaries of the women of the experimental group showed absence of corpora lutea and large follicles but an entirely normal count of primordial follicles, indicating a lack of damage from the steroids to the basic egg-producing process. There were no pathological signs in the ovaries. A similar prolonged study of rats receiving 19-nor steroids for very long periods gave similar data, as well as normal returns to fertility after a latent period.

In conclusion it appears, on the basis of data on nearly 1000 women to date, that Enovid is 100 per cent effective as an oral contraceptive when taken regularly from the fifth to the twenty-fifth day of the

menstrual cycle, and that side effects, such as nausea, dizziness, and headache, are absent in most cases and probably of psychogenic origin in the small fraction of cases who have these symptoms. No signs of pathology of the reproductive tract attributable to medication have emerged in women who have taken it. It is, of course, to be anticipated from known statistics that pathology of the reproductive tract may ultimately develop in a significant number of any sample of 1000 women irrespective of medication. The use of the substances tends to regularize menstruation, reduce menstrual pain, promote a feeling of well-being, and increase female libido.[25]

Implications for the Population Problems

What are the implications of these findings in relation to the problems of overpopulation? Science can only make inventions available. It is the public that determines their use, and in general the American public is remarkably apathetic to threats inherent in unlimited expansion of populations. Population pressures and the unrest they help generate are abrasive factors in international relations. The Communists are effectively exploiting the increasing poverty and unrest in Asia, Africa, and the Near East. But the right to unlimited procreation is assumed to be inviolate, and the question is shunned by politicians.

The fear is sometimes expressed that sexual promiscuity would increase and the family would be endangered if in time simple and highly effective methods of contraception become generally available. This issue must be balanced against the consequences of continued and rapid population growth. Moreover, it might be pointed out that birth control of some sort is widely practiced, especially among the better educated and economically favored. To what extent fear of pregnancy is a deterrent to extramarital sexual relations has never been determined. Nor have we any data as to whether efficient contraceptives, instead of inefficient ones in which people nonetheless have confidence, may increase promiscuity. In relation to the problem of promiscuity, it should be noted that the tablets must be taken for some days to assure blockade of ovulation. This would eliminate their use as rapid, temporary, and transient protectors against conception even if they were to become freely available.

New drug applications of the 19-nor steroids I, II, and III have been allowed for use by physicians under the authority of the Pure Food

and Drug Act. These substances are available to the public only by prescription, and I and II are used by gynecologists primarily to correct menstrual abnormalities. The physician is warned that they also block ovulation. They are not being recommended or sold by the manufacturers as contraceptives. The attitude of the manufacturers and of many physicians is to consider that more data are necessary to make certain that there would be no adverse effects from the daily use of the substances over periods of many years. General consensus is lacking as to criteria to assure the complete harmlessness of the medication. Views on this matter depend upon many psychological variables and prejudices operating in the persons expressing opinion.

The investigations of Dr. Pincus and his collaborators have been financed primarily through generous gifts from Mrs. Stanley McCormick made to the Worcester Foundation for Experimental Biology. The work has also been aided by grants from the Josiah Macy, Jr., Foundation and from the Planned Parenthood Federations of America. Patents for manufacture of the 19-nor steroids are owned by pharmaceutical companies whose chemists had synthesized them before their antifertility use was discovered, and the substances were made available by the manufacturers for purposes of investigation.

There is universal consensus in favor of medical and public-health measures that increase health and life expectancy throughout the world. Since life expectancy will probably be further prolonged by research, we must decrease birth rates if we are to control runaway populations. The 19-nor steroids reversibly block pregnancy without the destruction of life, and do this by acting after the manner of the natural hormone progesterone. Clearly, this is a better way to deal with the problem than the desperate measure of extensive abortions that the Japanese have found necessary to halt their runaway population growth. It is in countries where population pressures in relation to resources are especially acute that these substances may find an early use. Those concerned with human welfare may well hope that these or related substances may come to play a significant role in the control of world populations.

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    Biopsies of testicular tissue at the time of the failure of sperm production showed corresponding tissue damage in the Enovid and Norlutin therapy groups. However, such damage was not seen in the progesterone and Nilevar studies, despite failure of spermatogenesis. Within a relatively brief time following cessation of medication, the sperm count returned to normal or exceeded its pretreatment levels. While these steroids may be effective contraceptives in the male, their prolonged use is not acceptable.

The Catholic Position on Population Control

JOHN L. THOMAS, S.J.

THE FORMULATION of any position related to ethical issues necessarily implies a set of definite assumptions concerning the nature of the human agent and the requisite qualities of right moral conduct. In practice, Catholic ethical positions tend to be formulated on the basis of principles derived from both reason and faith, though Catholic thinkers have consistently vindicated man's natural ability to discover the basic principles and norms requisite for right moral conduct.[1] Since the divine law is manifested in the natures of things, the life of grace itself must build upon nature. Hence, however high above nature Christian ideals may stand, their foundations remain rooted in the laws of nature. The God who is conceived as the model of all perfection is also the God whose laws are manifested in the natures of things.[2]

Because the area of human activity is extremely complex, and because we acquire our knowledge of human nature and its essential tendencies through observation, there is ample room for development in ethical perspective. The basic premise that good is to be done and evil avoided is readily grasped in experience, but the application of this principle to specific human acts, depending as it must upon our limited knowledge of tendencies and purposes, is subject to imperfection, error, and development as we proceed to evaluate the more complex areas of human activity. Ethical judgments are practical judgments based upon insights into human situations. Although we benefit from the accumulated insights of the past, we must proceed with caution and humility in seeking to evaluate the evolving complex relationships of the present.

An intelligent judgment concerning the morality of birth control must be based on the logical application of general moral principles to this specific human act. It follows that those who base their considerations in this matter upon different moral principles will necessarily reach different conclusions. For example, the Christian who believes that the human person is a unity of body and soul, endowed with faculties of intellect and will, and possessing an essential relationship of origin, dependence, and destiny to his Creator, will judge the morality of birth control differently from one who maintains that man has no essential qualitative difference from other higher forms of animal life. This point appears to be all too frequently forgotten in current controversy. Disagreements concerning the licitness of birth control must logically be based on differences concerning basic moral principles, and since these are based on our concept of the nature, origin, and destiny of man, any worth-while discussion of disagreements must ultimately center on this point.

The premises upon which the Catholic position is based may be summarized briefly as follows. First, there is order in the world, established by a creative intelligence and revealed in the inherent purposes of things as discovered by observing their normal tendencies and operations. Second, as a creature endowed with reason, man achieves the development and perfection of his nature by using things in accord with the order established by the Creator. Third, it follows that men act reasonably when they use for their self-development and perfection all those things in nature which have been placed under their direct dominion. Fourth, the Creator alone is the author and source of life. He has not placed life or the faculties furnishing the co-principles of life under the creature's absolute dominion. Men hold these in trust from the Creator, so that they must respect their own lives and those of others, nor may they destroy them for their own personal satisfaction. They must also respect the integrity of their reproductive faculties and the normal process of the generative act in which they furnish the co-principles of life. The function of sex (the possession and use of faculties involving the co-principles of life) has been entrusted to men for the good of the species, and right reason demands that it be employed accordingly. Although the sexual act is designed for the propagation of the human race by the Creator, it is also a manifestation of conjugal love and creativity, a means of maintaining a stable, balanced, and affectionate union. Thus, the act has unique symbolic significance.

Population Problems

The praiseworthy success of medical science in achieving the postponement of death has dramatically upset a balance that mankind has hitherto taken generally for granted. What Malthus termed "the prevalence of people" is becoming one of the major challenges we face. Throughout much of the world, unprecedented annual increments of population are creating problems that bid fair to tax human ingenuity and available natural resources to their utmost. Not that we lack either know-how or necessary materials; nature is not as niggardly as the older classical economists appeared to believe. But a world sharply divided between rich and poor nations, rampant with rising nationalism, historically dichotomized into East and West, and ideologically polarized round Communism and capitalism, scarcely offers a propitious climate in which to tackle our population problems.[3]

In discussing issues related to population control, we must distinguish between the speculative, over-all problem of world population *vs.* world resources on the one hand, and specific, practical population-resource problems existing in various countries on the other. Among the latter, we must distinguish the problems of industrialized nations like the United States, where the management of large annual surpluses is an outstanding problem, from the problems of underdeveloped countries, where factors not directly related to the economy have induced and promise to maintain increases in population that place a serious strain on available resources. We must also recognize that population problems are not primarily economic, for economic factors make their impact felt on changes in the size of the population only through sociopsychological processes highly complex in their origin and operation. Finally, we must distinguish between known facts and more or less educated guesses. For example, Merrill Bennett, Director of the Food Research Institute at Stanford University, has pointed out some of the questionable assumptions and norms currently used to estimate past and present trends in per capita calorie consumption and world food supply;[4] while Philip Hauser, head of the Population Research Center, University of Chicago, has ably summarized the gaps in our knowledge of the relationships between population trends and socioeconomic conditions.[5]

Considering the dimensions of our ignorance, together with the known variety and complexity of the variables involved, it is best to

proceed cautiously when developing policies related to population control. As the Swedish population expert, Alva Myrdal, reminds us, "The population problem concerns the very foundation of the social structure," and if we are not on our guard, "there is a palpable danger that population policy will be irrationally narrowed down and forced into remedial quackery."[6]

The Catholic View of Parenthood

Catholic teaching has always maintained that those who choose the vocation of marriage find in children the divinely designed means of achieving full self-realization and perfection as mature Christians. Although children constitute one of the major blessings of marriage, their ideal number is relative to the capacities and peculiar circumstances of the individual couple who must bear and rear them to maturity.

In this connection, Catholic thinkers offer two observations. First, marriage, considered as a status, is a divinely designed institution through which men and women cooperate with the Creator in the propagation and education of the race. Marriage partners who habitually make use of the rights and privileges of this status implicitly accept the obligation of achieving its purpose; if they always avoided the possibility of pregnancy throughout their married life, they would show that they either did not understand the blessings of parenthood or were acting on motives alien to Christian standards. Second, in determining the extent of these obligations, the general principle applies that a positive law does not bind if its fulfillment involves proportionately grave inconvenience extrinsic to the law. Pius XII has enumerated under the general headings of medical, eugenic, economic, and social "indications" some of the sources from which such inconveniences might arise. As long as these exist, whether for a time or throughout marriage, the couple are excused from the obligation.[7]

Means of Population Control

In the light of these observations, we may conclude that, since Catholic thinkers seek roughly the same human goals and must rely on the same information as others in defining their position on population control, the distinguishing traits in their approach will be

found in the means they judge to be ethically acceptable. Stated briefly, the means for population control that they reject are direct abortion, sterilization, and all deliberate acts aimed solely and directly at the antecedent frustration or hindrance of the fecundity of the conjugal act, once it is freely initiated. They reject these means for the following reasons.

First, in regard to abortion, they view direct, deliberately induced abortion as murder. An abortion is direct when the sole immediate result of the procedure is the termination of pregnancy before viability. The Catholic position is based on the principle that human life is sacred and must be respected in the unborn as well as in others. Any operation that directly kills either the mother or the child is judged immoral.

Catholic moralists distinguish direct from indirect abortions. An abortion is indirect when it is the by-product of a procedure immediately directed to the cure of a serious pathological condition of the mother. In this case the interruption of the pregnancy is the undesired effect of a procedure immediately directed to secure some other good purpose, such as the stopping of a hemorrhage or the removal of a cancer. In deciding such cases, moralists apply the well-known principle of the double effect, which may be stated as follows: it is licit to perform an action which has good and bad effects, provided (a) that the action itself is not morally bad; (b) that the evil effect is sincerely not desired, but merely tolerated; (c) that the evil is not the means of obtaining the good effect; and (d) that the good effect is sufficiently important to balance or outweigh the harmful effect.

The second means of population control rejected by Catholic thinkers includes all deliberate acts aimed directly at the antecedent frustation or hindrance of the fecundity of the conjugal act. Such acts are commonly included under the broad term "birth control," but it is well to note that birth control may have many meanings, ranging from the planned limitation of offspring through periodic or absolute continence, to the control of fertility through the use of contraceptive devices. We shall use the term to include all deliberate acts that aim at depriving the conjugal act of its normal procreative quality or finality (e.g., the practice of *coitus interruptus* or the use of a condom).

It should be noted that birth control is considered illicit, not because its effect is the prevention of a possible conception, but because the act itself is judged to be contrary to the order of right

reason. Marriage partners who use birth control do not act as reasonable persons since they will to perform an act essentially implying the fulfillment of this initial stage, yet at the same time they do not will its fulfillment. Such action constitutes a clear contradiction in the practical order and is consequently a violation of the order of right reason. The act itself is considered intrinsically vitiated and thus unethical. It follows that the practice of birth control differs essentially from the use of rhythm, inasmuch as the latter does not vitiate the nature of the conjugal act.

Family limitation achieved through the observance of either absolute or periodic continence is considered licit by Catholic thinkers. They readily admit that the observance of absolute continence among normal couples may become extremely difficult and calls for a high degree of self-control. However, it is maintained that when marital situations calling for the observance of absolute continence arise, this becomes possible provided the couple have adequate psychological insight and motivation, and seek additional aid through prayer and the sacraments.

The observance of periodic continence based on rhythm[8] offers a somewhat easier means of the control of conception, since it is estimated that the period of ovulation can be predicted or ascertained with a fair degree of accuracy in roughly 80 per cent of married women. There seems little doubt that medical science will make further advances in this area.

Third, Catholic thinkers regard direct sterilization, whether permanent or temporary, whether performed for eugenic or contraceptive purposes, as morally wrong. Direct sterilization, as the term is used here, includes every interference with the generative function in which sterility itself, either perpetual or temporary, is intended as an end in itself or as a means to a further end. Direct sterilization is rejected because it is regarded as an unreasonable mutilation.

Sterilization is termed indirect when the resultant sterility is an unintentional by-product of a genuine therapeutic procedure – for example, when a cancerous uterus is removed. Indirect sterilization is judged morally permissible under certain conditions. A widely used principle in medical ethics, sometimes called the principle of "totality," applies here: the individual has the right to use the services of his organism as a whole and consequently may allow individual parts to be destroyed or mutilated when and to the extent necessary for the good of his being as a whole. The conditions required for

licit mutilation, whether by the removal of an organ or by the suppression of its function, are these: (a) the preservation of the organ or its functioning must be a source of actual harm or constitute a threat to the total well-being of the person; (b) there must be a well-founded assurance that the proposed mutilation will either remove or notably diminish the harm, and that this effect cannot be obtained without the mutilation; and (c) there must be a reasonable estimate that the good to be effected, e.g., by removing the harm, reducing pain, etc., will compensate for the evil effects consequent on the loss of the organ or function.[9]

In developing their position on the licit use of a pill to prevent ovulation, Catholic thinkers apply these general principles to the specific instance in question. Thus, if the use of the pill constituted *direct* sterilization as defined above, the action would be judged unethical; if its use resulted in *indirect* sterilization, the principle of totality would apply. It follows that such a pill could licitly be used to alleviate or eliminate various malfunctions or pathological conditions in the human system. Further, if a suitable means could be discovered to control anabolic disorders or marked irregularities in the menstrual cycle, its use for this purpose would be permissible.

Conclusion

The Catholic position on the licit means of population control is sometimes regarded as a cultural residue surviving from an unscientific, agrarian past and one incapable of meeting the practical exigencies of the modern world situation. For their part, Catholic thinkers point out that ethical short cuts are bound to be self-defeating in the long run. Their approach calls for greater understanding and appreciation of the significance of sex, marriage, and parenthood. Since man is the most valuable productive agent, cultural progress can best be promoted by creating conditions favorable to his highest development. Inasmuch as such progress implies self-discipline, a sense of responsibility, self-control, and the disposition to postpone present satisfactions for future gains, the widespread use of unethical forms of population control would hinder rather than promote requisite cultural changes. The different aspects of man's personality tend to be interrelated: one cannot exempt the important area of sexual activity from mastery and control, while expecting the individual to dis-

play these same qualities in other sectors of human endeavor. The control of man's basic drives according to the order of reason constitutes the necessary precondition both for personal development and for productive social endeavor.

What practical solutions to the present population problems do Catholic thinkers propose? First, in regard to the over-all problem of world population *vs.* world resources, they maintain that our answers must remain highly speculative. We can only guess at future long-range trends in science and population growth, but we appear to have sufficient resources in energy and food to handle foreseeable population increases, provided we are willing to develop the means of production required to use them.

Second, in regard to the complex, varied problems of the underdeveloped countries, Catholic thinkers advocate a multifaceted approach, including emphasis on universal education, social and economic reforms, capital investment that will make the best use of the abundant labor supply, and needed marketing and trade reforms. They also insist that the goods of the earth have been created for the use of all mankind, so that the resource-adequate nations now have a serious obligation to aid the resource-needy regions through financial and technical assistance to the extent that this appears feasible.

Third, they maintain that present population pressures in many contemporary danger spots could be relieved considerably by migration, better opportunities for trade, and freer access to needed raw materials, together with financial and technical help from richer nations.

Finally, in defining the modern dimensions of the Malthusian dilemma in underdeveloped economics, they point out that functioning social systems are integrated systems, so that gradual or piecemeal reforms such as birth control offer no solution to existing population problems. As cultural anthropologists insist, people can live with reasonable satisfaction in an archaic peasant society or in an adapted urbanized industrial one, but not in a halfway house. In other words, when the death rate is rapidly lowered by the introduction of alien techniques and practices that do not affect the traditional social or economic situations of underdeveloped countries, these societies must choose either an immediate conversion to an intensive industrial development, or increasing poverty and decline. Piecemeal reforms such as birth control are ineffective, both because they are

not aimed at changing traditional social and economic situations and because they will not prove acceptable until such changes occur.

The basic issue we face is not primarily population growth or resources, but man's ability to modify his cultural and social systems so that the fullest exploitation of the world's resources becomes possible. This calls for the elimination of traditional methods of exploitation by the more powerful nations in world trade and by the more powerful classes within each nation—in short, it calls for cooperation, organization, and serious personal effort.

REFERENCES

1. The official Catholic position is clearly stated in the Vatican Council, Session III, Cap. 2, and in the encyclical *Humani Generis* of Pius XII, *Acta Apostolicae Sedis*, 42 (1950), 561-578; English translation, *Catholic Mind* 48 (November 1950), 688-700.
2. For an interesting discussion of some of the implications of this view, see H. Richard Niebuhr, *Christ and Culture* (New York, Harper & Brothers, 1951), pp. 143 ff.
3. "When we take the very long view of man's world in the next century we see that the main problems are less those of technology than they are those of men's getting along with other men, communicating with other men, and organizing themselves in such a way that their genius and imagination can be vigorously applied to the problems that confront them. Our major problems involve the enriching, enlarging, improving, and mobilizing of our intellectual forces." (Harrison Brown, James Bonner, and John Weir, *The Next Hundred Years* [New York, The Viking Press, 1957], p. 153.)
4. Merrill Bennett, *The World's Food* (New York, Harper & Brothers, 1954).
5. "Our ignorance can be described in several dimensions. First, it may be stated that basic population data—statistics of the type derived from censuses, sample surveys, and birth and death registration systems—are entirely inadequate for most of the world's population. Second, and this is not unrelated to the first point, demographic theory is oversimplified and often obsolete. Third, we have only a limited ability to predict the specific demographic consequences of particular economic or social changes, and even less ability to make predictions in the opposite direction. Fourth, we have hardly begun to use such limited predictive knowledge as we have to trace a sequence of interrelated demographic, social, and economic changes. Fifth, we are particularly ill-equipped to provide policy makers and administrators with an adequate factual basis for social engineering purposes. The many gaps in our knowledge are dramatized by the Committee in its fifty recommendations for studies designed to dissipate ignorance in important areas." (Philip Hauser, in *Proceedings of the World Population Conference, Rome, 31 August – 10 September 1954*, Summary Report, United Nations, Department of Economic and Social Affairs, New York, 1955, p. 176.)

6. Alva Myrdal, *Nation and Family* (London, Kegan Paul, Trench, Trubner and Company, Ltd., 1945), p. 2.
7. Pius XII, address to the Italian Catholic Union of Midwives, *Acta Apostolicae Sedis, 18* (1951), pp. 835-854; for a good English translation, see *The Clergy Review, 36* (December 1951), 379-391; for an excellent commentary, see Francis Hurth, *De Re Matrimoniali,* Rome, Gregorian University Press, 1955.
8. For a detailed treatment of this problem, see John L. Thomas, *Marriage and Rhythm.* Westminster, Maryland, The Newman Press, 1957.
9. See Gerald Kelly, S.J., "Medico-Moral Notes," *Linacre Quarterly,* 20 November 1953, pp. 106-107.

Protestant Ethics and Population Control

JOHN C. BENNETT

THE PROBLEM of population has become an acute ethical problem, whether one is thinking of the world-wide increase of population and its effect upon the standard of living of nations and upon peace and international order, or whether one is concerned chiefly about the welfare of the individual family, the health of mothers, and the opportunities open to children. Protestantism has no specific moral laws that inhibit either family planning by individual parents or large-scale policies by which nations, and even the United Nations, may encourage such family planning. The spectacular lowering of the death rate, especially among infants, which has been effected by medical science makes it obligatory for us to find effective ways of reducing the birth rate. It has been well said that death control makes birth control a necessity.

I have been asked to write as a Protestant. Therefore I shall outline briefly the nature of Protestant ethics as I understand it. The difference between my views and those of Roman Catholic writers can be understood only against the background of a Protestant conception of ethics. There is no *cumulative* body of moral laws related to specific situations by means of a tradition of casuistry. Individual theologians and leaders have laid down the law in no uncertain terms about many matters, but I put the emphasis on the word "cumulative." Protestant systems of ethics have their day and lose force, and Protestants are brought back again to the central imperatives of Christian faith without much concrete guidance on specific dilemmas. The various forms of Puritan legalism have faded away, although there is today renewed appreciation of the Puritan sense of responsibility to

God that was deeper than the legalism. Also there has been a return to some of the moral insights of Puritanism, especially those associated with the rise of democracy, which were best expressed in the debates in Cromwell's army. Neither Luther nor Calvin can be said to be a guide on specific moral issues, except in this highly selective way.

Protestantism is today very much preoccupied with ethical problems, but the main emphasis is on the ultimate imperative of love, on the sources of motive and power for ethical living, and on the correctives for ethical distortion that are provided by the key doctrine of justification by faith. This doctrine means that the Christian himself is forgiven rather than fully righteous; it is the basis for all warnings against perfectionist or utopian illusions and against the danger of self-righteousness. There has been a strategic overemphasis in recent Protestant theology on the way self-righteousness becomes the source of hardness and cruel fanaticism. This has led to a widespread tendency to discount a direct concern for moral discipline as "moralism."

Protestantism has a great deal of pragmatism in its ethics. Judgments have to be made after the best thinking we can do about the probable consequences of our choices. Love intends the best available combination of consequences for all neighbors, and it should not be concerned primarily with the avoidance of particular acts that are absolutely condemned in advance by a law whose full applications are known. This pragmatism is not the sign of complete relativism, for the ultimate motive is known and there are criteria by which the consequences should be judged, although the fact that the criteria are in tension with each other leaves room for flexibility.[1]

As a result of this type of ethical thinking, Protestants expect to disagree on many issues. Yet they are in continuous conversation with one another, and there does develop from time to time a considerable consensus on important matters. The consensus does not extend to all members of the Churches; it is not a matter of taking a Gallup poll. It is rather a trend of thinking that characterizes those who take initiative in thought and in leadership and whose responsibility it is to emphasize the relationship of current thinking to the sources of the revelation, and who are able to transcend to some extent local and even national cultural pressures. This may appear to be very vague, but there is a process of ethical clarification, especially on social objectives, that does exist. Where there is no consensus about immediate action, there are at least boundaries within which the most serious

ethical thinking is done. This process has been going on for some time on problems of racial and economic justice and on some international issues, and the boundaries within which ethical thinking should be done in those areas have become at least visible. On those issues there are no characteristic Protestant, as opposed to Roman Catholic, ethical judgments. But when we move into the area of population control we find a growing Protestant consensus and, unfortunately, a serious conflict between Protestant and Roman Catholic convictions.

Protestants generally favor the use of contraceptives. They advise married couples to use them conscientiously, and – although they have given much less thought to this aspect of the problem – they usually favor government policies that make effective contraceptives available to the population as a whole.

Protestants generally believe that the spacing of children in a family, or at least the limitation of their number by choice, is important for the welfare of the children and for the health of the mother. Moreover, Protestants generally hold that it is neither possible nor right to depend on long periods of sexual abstinence to achieve this result. The assumption underlying this view is that of the two purposes of sexual intercourse – the expression of love between husband and wife, and the procreation of children – the first should not be subordinated to the second. This assumption presents perhaps the clearest difference between Protestant and official Catholic teaching. Whereas Catholics believe that any "unnatural" frustration of the second purpose makes it against natural law to seek realization of the first, I know of no Protestant thinker of wide influence who would agree.

Since it is so often suggested that the Protestant view is merely a way of following the line of least resistance, a concession to man's sinful desires, I want to emphasize that Protestants increasingly believe the use of methods of birth control to be a duty for many people. *It may be a moral obligation to limit the number of births in a family, and it may also be morally wrong to advise a married couple to refrain from intercourse for long periods.* There are strains enough in marriage without adding this one, with all the mutual resentment or hostility it may create, if there is not full and willing assent to the practice by both partners. Moreover, even conscious assent may not necessarily prevent this kind of strain.

Dietrich Bonhoeffer, a Protestant theologian deeply admired both for his martyrdom in the struggle against the Nazis and for his con-

tribution as a thinker, has written strongly on this subject in his *Ethics*. Many others have taken the same position, but I quote him because, while there is often boldness in his thought, he cannot be accused of being a mere follower of modern trends. He wrote:

> But as a matter of principle Catholic morality recognizes only one means for the achievement of this purpose [the limitation of the number of children in a family], namely total abstention. But in this way it undermines the physical basis of marriage and threatens marriage itself with nullification and destruction by robbing it of its fundamental right. . . . It certainly eliminates the unnatural act of preventing conception, but this is replaced by the unnatural state of a marriage without bodily union.[2]

Protestants also believe that birth control should not be practiced as an escape from parenthood in the normal marriage. Usually there is a responsibility to have children as well as to limit their number. Either to give birth to children or to prevent the birth of children may be irresponsible. The individual should approach such decisions conscientiously, prayerfully, in the spirit of obedience to God. I realize that when the issue is taken out of the sphere of conscientious personal decision and becomes a factor in public policy and in mass education, it is more difficult to prevent the irresponsible use of contraceptives. But this danger must be weighed against the danger of overpopulation.

I have spoken of an approximate Protestant consensus on the general question of birth control. Several American denominations, including the Methodist Church, the United Lutheran Church, and the Augustana Lutheran Church, have expressed themselves decisively on the matter. Others are at present preparing statements under the immediate pressure of the threat of "population explosion." The most significant development is the gradual change of convictions among the Anglican bishops, as presented through the reports of the Lambeth Conferences. In 1908 they spoke out unambiguously against the use of contraceptives. In 1920 they were still opposed, but Bishop Kirk, the leading Anglican authority on moral theology, sensed the beginnings of permissiveness on the subject.[3] The Lambeth Conference gave clear permission for the conscientious use of contraceptives in 1930, and was even more forthright in 1958 in presenting the case for birth control. This development is significant, partly because Anglican bishops are not reckless innovators and partly because they look for guidance to a considerable extent to the

Catholic tradition of moral theology and are often cautious about taking any action that widens the separation between their Church and the Roman Church.

The Protestant theologians of widest influence generally give moral support for the conscientious use of contraceptives. Sometimes this is done with a degree of reluctance, but, all things considered, it is recognized that the use of contraceptives may be necessary. Increasingly the stress is on the positive values for marriage if sexual intercourse can at times be separated from procreation.[4]

The problem of population involves not only the quantity but also the quality of the world's future inhabitants. The effect of man-made radiation on the population to come requires close study, although the prevention of the genetic deterioration of the race from this cause now depends chiefly on political decisions not directly related to any kind of genetic planning. What does Protestant ethics have to say about forms of genetic planning, about the voluntary or, in extreme cases, the compulsory sterilization of those who by any standards are unfit to pass on their biological characteristics to future generations? Protestant ethics knows no law against such genetic planning, but I think that most Protestants would be very sensitive to the dangers in any elaboration of state policy in this field. To some extent the availability of effective and easily used birth-control methods would enable society to deal with this problem through education and voluntary action.

In principle, provision by the law of the state for the sterilization of those whose genetic unfitness is clear would be widely supported by Protestants. But there is danger in this kind of human engineering as it gains momentum. We cannot reject it, but we must beware of what might develop if society were to decide explicitly what sorts of human beings should or should not be born. There is here a threat to the liberties of the individual in the area of his most intimate personal life, where his freedom has been most secure from political interference.

The Protestant student of ethics knows no absolute law or principle that should control the solution of this deep and vexing problem. There must be freedom for each generation to deal with it with the sensitivity that love should inspire – sensitivity to the liberties of living persons and to the sufferings and frustrations of those who may be born with grievous physical and mental handicaps. I mentioned earlier the concept of boundaries within which ethical action should

be taken, rather than fixed laws that should dictate particular decisions. This is the best that Protestants can offer. But action within these boundaries should always be directed by men who are open to the inspiration and judgment of God as He had made Himself known in revelation – by men who are sensitive to the needs and aspirations of their neighbors, and especially of those who have least power to defend themselves.

NOTES

1. This is not the place to compare Protestant ethics with Catholic ethics, but it might help to say that on most issues Catholic laws are related to one another and to the situation by the use of "prudence," and that this relation provides much flexibility in practice. But there are in Catholic ethics a few areas where the absolute law on a particular matter seems to Protestants to be given a too privileged position in the context. This is especially true of the spheres of sex and medicine.
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3. K. E. Kirk, *Conscience and Its Problems* (New York, Longmans, Green & Co., Inc., 1927), p. 292.
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American Intellectuals: Their Politics and Status

SEYMOUR MARTIN LIPSET

THE SUPPOSEDLY unhappy plight of the intellectuals in America has been a favorite topic for introspective analysis by many in this occupational category who see themselves as unappreciated by society.[1] On the other hand, some persons, particularly businessmen and conservative politicians, have viewed the intellectuals as excessively critical of traditional American values and as dangerously influential. How accurate are these opposing images?

We shall here consider intellectuals to be all those who create, distribute, and apply *culture*—the symbolic world of man, including art, science, and religion. Within this group, two main levels may be discerned: the hard core, who are creators of culture—scholars, artists, philosophers, authors, some editors, and some journalists; and second, those who distribute what others create—performers in the various arts, most teachers, most reporters. A peripheral group are those who apply culture as part of their jobs—professionals such as physicians and lawyers.

When Europeans speak of the *intelligentsia*, they mean those in all three categories. In America, however, where the university-educated are much more numerous, they do not constitute a distinct class or community, and it is usual to include only the two main categories—the creators and distributors of culture. In this paper, I propose to discuss the political behavior of those engaged in these occupations, and then to suggest some of the underlying factors that seem to account for their political behavior.

The Dominant Politics of the Intellectuals

In the days of McCarthyism, the now defunct journal *Facts Forum* charged the intellectuals as a group with being most vulnerable to Communism, and described them as "lawyers, doctors, bankers, teachers, professors, preachers, writers, and publishers."[2] This listing

of supposedly Communist-inclined occupations, while ludicrous, does give an important clue to the nature of the politics of intellectuals and the sources of political anti-intellectualism in America. *Facts Forum* attacked those occupations whose practitioners were university-educated precisely because these professional groups were the most effective opponents of McCarthyism.[3] A considerable body of evidence demonstrates that the better educated individuals are, the more likely they are to favor all forms of "noneconomic liberalism," such as civil liberties for unpopular political minorities.[4] This, of course, was one of the motives for the attack of the extreme right, as represented by *Facts Forum*, on "the American respectables, the socially pedigreed, the culturally acceptable, the certified gentlemen and scholars of the day, dripping with college degrees."[5]

The facts about the politics of American intellectuals are fairly clear. During the twentieth century, the great majority of academics (particularly those in the social sciences), as well as most significant literary figures and most leading journals of opinion, have been opposed to conservative thought and action in political and religious realms. Regarding the latter, quantitative data reporting on the beliefs of the academic profession have been available from before the First World War until the present. In 1913-1914 and again in 1933 James Leuba, a psychologist, studied the religious beliefs of the membership of the sociological, psychological, and historical societies, and of scientists listed in *American Men of Science*, and reported that a majority of the sample of each group denied a belief in God or immortality. Comparable questionnaires completed at the earlier date by 927 students in nine "highly respected" colleges indicated that 90 per cent of the undergraduates affirmed a belief in God. Although we have no equivalent data on nonacademic occupational groups, other studies of American religious behavior suggest that the attitudes of the students conformed to general sentiment more than did those of the professors. Actually, about 55 per cent of all persons fourteen years of age and older were affiliated with churches before World War I, a figure which fell only slightly in the 1930's. Among the members of the American Sociological Society who replied to the questionnaires, the nonacademics were more likely to have religious beliefs than were the faculty members. It is noteworthy that on both occasions the more distinguished professors in each discipline were less identified with religious beliefs than were their less eminent colleagues.[6]

In 1937, a survey conducted in Chicago reported pro-New Deal sentiments among 84 per cent of the professors of social science and 65 per cent of natural-science faculty members, as contrasted with 56 per cent among manual workers, 16 per cent among lawyers, physicians, and dentists, and 13 per cent among engineers. Roughly similar results were obtained by this survey with regard to attitudes on various socioeconomic issues.[7] Almost two decades later, interviews conducted with a systematic national sampling of over 2000 social scientists teaching in American universities in 1955 revealed that three-quarters were Democrats and that two-thirds had voted for Stevenson in 1952, a year in which nearly half the manual workers and members of trade unions had voted for Eisenhower. As in the case of the two studies of religious belief, this investigation found that the more distinguished professors included an even higher proportion of liberals.[8]

Academics, of course, are not the only group among the intellectuals who strongly support liberal politics. In 1947 a survey conducted by *Time* magazine, based on questionnaires and returned by over 9000 university graduates, asked how they had voted in 1944, and reported large Democratic majorities among teachers, scientists, and practitioners of the arts.[9] It is significant that, while 60 per cent of the respondents who reported their occupation as "scientist" voted Democratic, 80 per cent of those listed as "engineers" had voted Republican in 1944.[10]

Journalism comprises a high proportion of members with liberal political and economic philosophies, as is shown by studies based on interviews. In the mid-'thirties, a study of 104 Washington correspondents, a highly paid elite group, found that only 30 per cent had voted Republican in 1936, while 6 per cent had supported the Communist or Socialist candidate and the large majority had backed Roosevelt. Although the average salary of this group was over $6000, a considerable income for that period, 40 per cent of these journalists favored government operation of the mines, public utilities, and the railroads, and 56 per cent supported the organization of a reporters' trade union.[11] Many of these political attitudes reflected depression conditions; nevertheless, straw votes conducted among reporters in later years on the campaign trains of the Presidential candidates of both parties suggest that as a professional group journalists have remained sympathetic to the Democratic Party and to liberal causes. A more recent survey of another elite group, the for-

eign correspondents in Western Europe, reported that, in the winter of 1953-1954, 58 per cent of those interviewed stated that they favored Stevenson, while 36 per cent supported Eisenhower for re-election.[12]

The arts have contributed heavily to Democratic support. Only 16 people were classified as being employed in "the arts" in the *Time* study of college graduates, but this group was overwhelmingly pro-Roosevelt. Like the journalists, those creative artists who are employed are almost entirely organized within trade unions, and their unions have also shown a strong liberal or left-wing political slant. Other indications of liberal leanings among artists may be seen in the substantial financial backing of the Democratic Party on the part of those employed in the motion-picture industry.[13]

It may, of course, be argued that support of the Democratic Party is not in and of itself evidence of liberal or left-of-center politics, since that party includes many relatively conservative individuals among its ranks. But the available evidence suggests that the support given the party by intellectuals is basically related to the fact that it has been the party of the have-nots and of liberal social reform. Thus, a large part of the membership of what is basically the left wing of the Democratic Party, Americans for Democratic Action (ADA), has come from intellectuals, and its strongest sections have been in academic communities. Perhaps even more conclusive evidence that the intellectual is attracted to the ideological left is the fact that the relatively small leftist third parties, both Socialist and Communist, seem to have secured more support from intellectuals than from any other stratum of the population. Thus a study made in 1934 of party registrations in the then strongly Republican Santa Clara County (suburban San Francisco) found that one-quarter of the professional writers had registered as members of the Socialist and Communist parties; only one-third were Republicans.[14] Librarianship, an occupation closely linked with the intellectual world, also shows strong leftist in addition to liberal propensities. In 1948, a study asking a national sample of librarians to list their first choice for President reported that 17 per cent listed minority left-wing candidates.[15] Communist factions have been disproportionately strong in contested elections within trade unions dealing with intellectual occupations, such as the American Newspaper Guild, Artists Equity, and the Radio Writers Guild. And it is no secret that Hollywood was a major source of Communist Party funds in this country.[16]

The Communists and their fellow travelers have never been more

than a minority among American intellectuals (regardless of how that minority is defined), although as we have seen they did at times constitute an influential minority during the 'thirties and the 'forties. It is precisely here that the liberal bent of American left-wing intellectuals becomes apparent: most intellectual groups organized to combat Communist influence among the intellectuals have been led by Socialists and somewhat left-wing liberals. The most important such group in recent times, The American Committee for Cultural Freedom, has been under the leadership of Socialists such as Sidney Hook and Norman Thomas, or of men active in the New York Liberal Party, such as George Counts and James T. Farrell.

Thus in general the wide variety of evidence to be adduced concerning the attitudes and political affiliations of writers, practitioners of the arts, journalists, librarians, scientists, and university professors, shows that these intellectual sectors of the middle class have given more support to the Democratic Party and to minority liberal and left-wing parties than has any stratum of the population, in proportion to its size.

The General and Specific Sources of Liberalism

The analysis of the sources of the historic political position of American intellectuals is a more complex problem than is the documentation of the phenomenon itself. Part of the answer lies in the conditions general to the life of the intellectuals in most societies, conditions that account for the patterns of left-wing support by such groups in other countries. Thus Bertrand de Jouvenal has pointed out that there is an inevitable conflict between the values of the business classes and those of creative arts. Business is institutionally committed to giving its clientele what they want. In contrast, the creative artist tends to view the worth of his products independently of their immediate market utility.[17] Since rewards for cultural products in modern capitalist society increasingly depend on a market organized round business norms, the divergent views of the middleman or employer as to creative talent (e.g., Hollywood executives, newspaper owners, book publishers) and the professional norms of the artist are bound to lead either to hostility toward the businessman by the artist who cannot or will not create by the criterion of marketability, or else to feelings of self-deprecation and a sense of self-interested surrender of personal integrity among those who successfully adapt to the market.[18]

Although one could discuss other factors among those intrinsic to intellectual occupations and likely to affect the political values of intellectuals everywhere,[19] there are sources for the liberalism of American intellectuals that are specific to this country and its history. Two factors, both resulting from our egalitarian ideology, have been important in this regard. First, the ideology most easily available to American intellectuals historically has been the egalitarian dogmas of the Declaration of Independence; second, the very intellectuals who completely accept the egalitarian implications of the American Creed have felt as a group underprivileged because they have not been accorded the symbols of high status their brethren in Europe receive. Ironically, some of the reasons why American intellectuals do not secure the signs of the respect they crave may derive from the very strength of the egalitarian norms they espouse.

As to the first point, it is a curious fact that there is no really conservative tradition in America—a condition common to many former colonial countries.[20] The American Creed evolved out of a prolonged revolution. And Americans, regardless of party, class, or religious persuasion, on the whole *do believe* in their revolutionary creed—unlike those Europeans who live in societies with ancient aristocratic class structures and established churches, in which the forces of conservatism never really accepted the legitimacy of egalitarian democracy even when imposed by revolution.

This means that conservative ideologies that look back to a golden age have never held sway in this country (except to some degree in the South and among some nineteenth-century New England families). Consequently, no conservative "utopia" has ever been counterposed to the egalitarian utopias that have guided our political struggles. The political intellectual, the man of ideas, is nowhere very interested in defending inconsistencies, and every status quo is full of inconsistencies. Only by attacking the limitations of his political and social order can such an intellectual feel he is playing a fruitful creative role. In Europe he has been able to do this either by supporting a reformist utopia, an image of the good society of the future, or by advocating a conservative utopia, usually in the image of a society with traditional values, an Establishment, and a creative aristocratic elite who have no need of flattering the uncreative masses. The ideal society of the reformer is in the future, while that of the conservative is in the past. Each can criticize the present from the vantage point of an image of these "good" societies. And quite often

both dislike the same features of the present, such as the nature of popular culture, which the leftist blames on the institutions of a business society, and which the conservative sees as necessarily flowing from the fact that democracy gives the masses power over taste.[21]

The restrictions of possible ideological choices for American intellectuals has meant that even the conservatively disposed have defined their political ideals in terms of the only available doctrines —those of their revolutionary past—doctrines which true European conservatives have abhorred as the rankest radicalism. In a book written in the early 1930's, unfortunately almost unknown, Leon Samson[22] pointed out amazing parallels between the language used by certain important American businessmen and Republican political leaders to describe the nature and objectives of American society and the statements of certain Socialist and Communist leaders from Marx to Stalin. Samson argued that a principal cause for the failure of the socialist movement in America has been the fact that the symbolic goals of socialism are so closely identical with those of Americanism that Americans feel no need to adopt a "foreign" version of Americanism. American conservative politicians have not had an ideology, they have simply attempted to prevent change;[23] or, like the "modern" Republicans of today, they have competed with liberals in seeking egalitarian reforms they could espouse, thus justifying themselves in the light of the American Creed. American conservative parties, in fact, have demonstrated their own liberalism in noneconomic spheres by waging a more consistent fight for Negro rights than did the pre-Roosevelt Democrats.

The second major source of the political leftism of American intellectuals, as already mentioned, derives from their seemingly almost universal feeling that they are an underprivileged group, that they are not high on the ladder of social recognition, income, and power, as compared with businessmen and professionals.[24] In a recent study, social scientists teaching in universities were asked how typical businessmen, Congressmen, or college trustees would rank professors, in contrast with "the manager of a branch bank, an account executive in an advertising agency, and a lawyer." The majority of those answering thought that businessmen and Congressmen would put them (the teachers) in the last place. The replies were most confident as to the status of professors in the eyes of college trustees, but even so almost half the respondents with opinions said that the

"average" trustee would rank them either third or fourth. This low self-image encourages professors (and, I would suggest, other intellectuals) to pursue the same political path as other "deprived" groups the world over in supporting those political parties that attack the existing distribution of privilege, and in an antagonism to those who are "over-rewarded"—the business classes. The data clearly show that feelings of low status are closely correlated with the advocacy of liberal politics. "The Democratic voters are consistently more inclined to think that nobody loves a professor."[25]

The Real Status of the Intellectuals

It is a surprising fact, therefore, that the image of the American intellectual as held by his fellow citizens is quite different from what he himself thinks they hold. While he may feel himself neglected and scorned, his work poorly valued by the community, the community itself places him fairly high when polled on the relative status of occupations. In one such study of the ranks of ninety-six occupations, conducted in 1947 by the National Opinion Research Center of the University of Chicago, college professors ranked above every nonpolitical position except that of physicians; artists, musicians in a symphony orchestra, and authors ranked almost as high.[26] Essentially, this study suggests that those in the intellectual occupations enjoy about the same prestige in America as do important businessmen, bankers, and corporation directors.[27] In 1950 a second national opinion survey reported similar results. This study asked people to place various jobs in the "upper, middle, working, or lower classes." Professors came out fourth among twenty-four categories, and 38 per cent of those polled placed them definitely in the "upper" class.[28]

It may be argued that national surveys reporting the opinions of the total population are not significant, since what counts is the opinion of the elite. The social science professors interviewed for *The Academic Mind* considered that big businessmen and high government officials simply do not respect intellectuals. Yet studies that have compared the differential ratings made by people from different classes indicate that those in high social and economic positions actually think far better of intellectual pursuits than do those in the working and lower classes.[29]

Perhaps the best evidence that intellectual occupations, particularly college teaching, do enjoy a high status in America derives

paradoxically from the same professors cited above, the majority of whom reported that they thought their occupation would be ranked relatively low by businessmen and politicians. These professors, who constitute a good sample of university social scientists, turn out to come from "relatively high status . . . family backgrounds," as the data in Table I indicate.

TABLE I

Social Origins of University Social Scientists

Source: Lazarsfeld and Thielens, *op. cit.*, p. 7.

Father's Occupation	*Per Cent*
Teacher	8
Other professional	23
Managerial	25
White collar and small business	15
Farmer	13
Manual laborer	15
No information given	1
	100 (2451)

Though professors prefer to believe they are undervalued by people outside the intellectual community, the fact that they are able to attract to their ranks men from relatively privileged origins suggests that their occupation is highly valued. Almost half the respondents have fathers who are in managerial posts or professions other than teaching. Only 15 per cent are the children of manual workers. A comparison of these data with those reported on different samples of the American business elite, the heads of the largest corporations, indicates that the origins of both groups are roughly similar.[30] Actually, the comparison may be unfair to the academic profession, since the sample of college professors is drawn from all institutions of higher learning in the United States, whereas the professors at the better institutions (which are on the average the larger schools) come from higher socioeconomic backgrounds: 62 per cent of those at very large schools (above 9000 students) are from managerial or professional families, as contrasted with 49 per cent at very small schools (700 or below); two-thirds of the social scientists at private nondenominational schools are from high-status backgrounds, as compared with 44 per cent at institutions with a religious affiliation or at teachers colleges.[31] Since the social sciences are not generally

those disciplines with the highest prestige within a university, it is likely that the social origins of humanists and natural scientists are even higher. But the facts we already have as to the attitudes of the general population and the family backgrounds of social scientists constitute a powerful argument for the thesis that academic and other intellectual occupations in the United States are high in social prestige.

The Contradictions of Real and Presumed Status

Since the American intellectual's self-image as one of low status seems to be one source of his leftism, and since the facts contradict this appraisal, the question naturally follows: why then does the intellectual feel that he is looked down on?

I suspect that in large measure his feelings of inferiority derive from his glorified conception of the status of the European intellectual and from his using the European situation as a comparison.[32] Anyone who has ever been in a discussion about the life of an intellectual in this country knows that sooner or later someone will remark that in England, Germany, France, or Italy a writer, painter, composer, or professor really counts. There, such a man is recognized by the public and by the political and economic elites.[33]

It is certainly true that there is a difference between the European and the American treatment of the intellectual. This difference is no more or less than the difference between a fairly rigid class society and a society that emphasizes equality. In Europe, open or apparent deference is given *all* those with higher status, whether engineers, factory owners, or professors, whereas in this country it is not given anyone in such categories to the degree it is abroad.[34] As A. G. Nicholas has pointed out in comparing the situation of the American and the British intellectual, the latter "has been in some degree sheltered by his very position in what Bagehot called a 'deferential society.' Not *very* deferential to him, perhaps; less deferential than to the landowner, the administrator, the soldier, the clergyman or the lawyer, over all of whom the protective gabardine of the appellation 'gentleman' has fallen more inclusively, with fewer loose ends sticking out. Nevertheless the [British] intellectual has shared in it too, whether he was behaving as a rebel or as a hired apologist."[35]

Obviously intellectuals receive a gratifying social deference in many parts of Europe—but so do all positions of high status. What the American intellectual who envies his European brother fails to

see is that he is really objecting to the egalitarianism of the United States, rather than to a lower evaluation of his occupation by its citizens. Unconsciously, he thinks in European terms, adopting the criteria of conservative middle- and upper-class European travelers and *émigrés* in America who have found American egalitarianism distasteful.[36]

The Effects of Isolation and Low Income

Two other sources of the low self-appraisal and consequently leftist politics of American intellectuals that do not follow directly from American egalitarian values are the seeming isolation of intellectuals from other sections of the elite (particularly their lack of direct contact with political power) as compared with that of European intellectuals, and their income, as contrasted with that of business executives and professional men.

It is true that the average American intellectual has less direct contact with other sections of the elite, particularly with men who wield political power, than does the average European intellectual. Why is this true? The fact is that there are, in absolute as well as proportionate terms, more intellectuals in America, and they are more widely dispersed geographically than in any other country. This matter of numbers can be quite important. For example, in 1929 *all ten* professors of economics in Australia met and told the government they believed it would be disastrous for the country to go off the gold standard. The Labor government of the day was not happy about this, but it felt it should not move against the "experts." There are far too many such experts in America for them to have such a corporate influence. In this country there are more than fifteen hundred colleges and universities, while Great Britain has about fifteen, West Germany less than twenty, Norway one, Denmark two, Sweden four. In the United States, the Boston area has about 9000 teachers of college and university rank, and the northern California area of which San Francisco is the center has 14,000. In Greater New York City alone there are well over 20,000 persons teaching in about forty institutions of higher learning.

No city in the world approaches New York in the number of intellectuals employed in publishing houses, magazines, and other intellectual enterprises, in addition to those in universities. While New York may be said to be the intellectual capital of the United States, there are important groups of intellectuals scattered round the

country whose combined number is far greater than those in or adjacent to New York.[37] Important schools of painters and writers exist in various parts of the country, from Seattle and Los Angeles on the West Coast to New Mexico, New Orleans, Chicago, and Boston. The two leading universities in the country (as judged by faculty caliber ranked by authorities in the various academic disciplines) are located in metropolitan Boston and San Francisco.

The sheer numbers of intellectuals in the urban centers, as well as the enormous size of the country, necessarily limit the extent to which intellectuals in the same field are acquainted with one another, let alone with those in other fields such as politics or business. Academics in large cities often know well only those within their own disciplines; and I can testify from direct experience that social relations among people in the same specialization in different universities in the same large community are rare. There are over sixty historians employed full time on the faculty of Columbia University. The Berkeley faculty harbors more than thirty sociologists, more than are employed by all the British or Canadian universities. Groups of artists, *avant-garde* writers, and those employed in publishing houses exist in many cities, but their membership is often too large to permit much contact with other groups. The relative isolation of the American college professor from all groups, intellectual or other, is borne out by the Lazarsfeld-Thielens study of social scientists. Over three-fifths of the respondents (62 per cent) reported that "their main social contacts are confined to the university," a figure that rises to above 70 per cent among those at the more distinguished colleges and universities.[38] Conversely, in countries with a smaller elite, there is necessarily much intermingling. As Irving Kristol, who has edited *Encounter* in London and *Commentary* and *The Reporter* in New York, has put it, "What has astonished me, and what astonishes any American, is the extent to which almost all British intellectuals are cousins. . . . In America it is otherwise, to put it mildly. . . . It is by no means unimaginable that the senior editors of *The New Yorker* should never have met the senior editors of *Time*."[39] Dwight Macdonald, whose writing experience also includes both cities, has commented, "As an alumnus of both of these magazines, I can testify this is accurate; intellectual circles in New York are neither concentric, interlocking, nor tangential, and one knows 'personally' . . . only a small proportion of the authors whose books and articles one reads. The London intellectual community is much broader, including busi-

nessmen, lawyers, and even publishers, even Members of Parliament."[40]

The government of the United States, even when the Republicans are in office, does employ and consult professors and other intellectuals. According to John Fischer, "The Eisenhower administration employs more professors than the New Deal ever did."[41] (The Republican need for intellectuals may be seen in the fact that the two professors who have recently written sympathetic appraisals of the party, Arthur Larson and Malcolm Moos, have since been employed as Presidential aides in the White House.) The great majority, of course, are unlikely to be thus singled out, but I would guess that as many, if not more, professors and other intellectuals are employed or consulted at high levels by the state and federal governments as in most European nations. It is only when the comparison is made in terms of proportion between one class in one country and that in another that Americans rate lower—there are just so many more of them.[42]

Thus, while the size and decentralization of American intellectual life remove the individual intellectual from contact with other sections of the elite and give him a sense of deprivation when he compares his situation with what he conceives to be that of his British or French counterpart, an analysis of the causes of this deprivation do not justify the conclusion drawn by many intellectuals that they are being ostracized or rejected by nonintellectuals.[43]

Another point, and a very sore one, in the negative image the American intellectual has of himself is his income. Compared with businessmen and independent professional men, he is impecunious.[44] His argument goes like this: people are paid according to what they are worth, and consequently lower pay implies lower value. This syllogism omits the important fact that there are really two income structures in modern Western countries, the private one and the public one. The public position of high status is always more poorly paid than is a corresponding private one. A lawyer at the peak of his profession, as for example, a justice of the Supreme Court of the United States, earns a good deal less than does many a corporation lawyer in private practice. When Eisenhower's cabinet officers left private employment, they had to take considerable cuts in salary.

To consider a comparable group of intellectuals, the leading professors at major American universities earn salaries that compare favorably with those paid in all but the very summit of high-level

posts in government or other nonprofit institutions. Thus the minimum salary for full professors at certain good universities is at present $12,000 for the academic year and many earn above this minimum. Many professors make considerably more money on the side, in consulting fees from corporations and governments, in fees for articles, lectures, and books. Data in the study of social-science professors cited previously show that 62 per cent of all in this field have outside sources of income, and that the more productive faculty members (earning presumably the highest regular salaries) are most likely to secure extra income. It is true, of course, that many professors could earn more in private industry, but this very fact disproves the contention of those who claim that their talents are undervalued. The truth is that professors, like the lawyers who become judges or elective officials rather than corporation counselors, really believe that the noneconomic rewards of the job are better than monetary gains.

The Political Success of Intellectuals

The two defeats of Adlai Stevenson have been taken by many intellectuals as indication of the inability of American intellectuals to play an effective role in politics. But it is doubtful whether his defeats by the charismatic personality of Eisenhower prove more as to the effectiveness of an "intellectual" approach to campaigning than did Stevenson's success in his 1948 race for Governor of Illinois, when he ran 400,000 votes ahead of the "man of the people," Harry Truman. Actually, on the level of party politics and electoral office, intellectuals do amazingly well. In the United States Senate there are fourteen former members of college faculties (eleven Democrats and three Republicans), while more than half the remaining Senators have *earned* advanced degrees.[45]

The ability of American intellectuals to win office is especially striking, given the fact that the American electoral and party system, with its lack of central party control of the candidates, makes it difficult for men to obtain party nominations unless they come up via machine politics and enjoy the backing of local party officials. In much of Europe, on the other hand, the officers of centralized parties can confer nominations on party intellectuals. Few American intellectuals are prepared to follow the path of direct participation in local politics, as has been successfully done by Paul Douglas, Richard Neuberger, Ernest Gruening, or Hubert Humphrey.

Anti-intellectualism and American Values

We have seen that much of the self-deprecating image projected by the American intellectual to justify his feelings of alienation from his society turns out to be invalid. This does not mean, of course, that there have not been strong anti-intellectual tendencies in this country, and these further account for the continuing lack of a conservative politics on the part of intellectuals. Anti-intellectualism in this sense does not imply that intellectuals are historically a low-status group in America. As will be seen, the opposite may be true. This source of alienation stems in part from democratic aspects of American society, from the lack of hereditary aristocracy with a tradition of upper-class behavior, and from the early history of adult suffrage.

The absence of an aristocratic class and the presence of an egalitarian ideal have meant also that for a long period this country lacked the respect for cultural activities developed by traditional aristocracies as part of their way of life, and taken over by much of the European bourgeoisie as they sought to emulate the role of the class they replaced. For much of the nineteenth century, particularly the second half, the rise to dominance within the economy of literally hundreds of self-made millionaires brought into prominence and civic power individuals who lacked the social graces and cultural interests of the established upper classes. The self-made man tends to emphasize the importance of material success and of conspicuous material possessions, and to deprecate seemingly nonproductive activities. He takes pride in economic and technological advance. During the latter part of the nineteenth century, many American intellectuals such as Henry Adams felt outcast in a world dominated by such men.[46]

During the twentieth century the vulgarities of taste introduced by the so-called "robber barons" began to decline. Their scions gave rise to the *Social Register*, and they have attempted to create an American aristocracy. Digby Baltzell in a recently published study of the Philadelphia upper class has well described the emergence in this century of elite private schools such as Groton (which have come to play a part comparable to that of Eton and Harrow in Britain), the gradual centralization of upper-class education in a few universities, the codification of upper-class membership in the *Social Register*, and the conversion of high-status families to Episcopalian-

ism.[47] All these trends have served to reduce, if not to eliminate, the type of materialistic anti-intellectualism which disturbed Henry Adams.

Nevertheless, as overt anti-intellectualism stemming from the social situation of the *nouveaux riches* declined, a new source of anti-intellectualism emerged. The antagonism to American culture as dominated by business, which had led many nineteenth-century intellectuals to withdraw completely from any concern with politics or public affairs, turned in the twentieth century to the support of liberal and left-wing politics, first Progressivism and Wilson's New Freedom, later Marxism or the New Deal.[48] Marcus Cunliffe suggests that World War I, "along with the Russian Revolution . . . finally proved to the American *avant-garde* that they knew better than their society. It is not too wild to say that 1917, the year of revolution and mutiny, also marked a cultural revolution in America—a movement that was to adopt the vocabulary of Marx together with that of Freud."[49]

The emergence of the intellectual into the political battle as an active partisan brought with it anti-intellectualism as a line of counterattack by the harassed political and religious conservatives. The long history of attacks on the special views of intellectuals, going back to the early nineteeth century, reflects in large part the fact that the United States has the longest continuous history of democratic politics and adult suffrage.[50] It is clearly necessary for men in politics to try to demolish the strength of the views of the opposition, and the very fact that the intellectuals have always claimed that their superior education and intelligence make their views important has tempted those who disagreed with them, in both Europe and America, to resort to anti-intellectualism.[51] Nowhere do the masses have any real understanding of or sympathy for the problems of intellectual life, and they can be roused against the intellectuals as part of their general resentment of the advantages of the more privileged and powerful. Friedrich Engels has noted how in the early days of the European socialist movement it was possible for anarchists and other left-wing opponents of Marx to foster among communist workers an "ineradicable suspicion against any schoolmaster, journalist, and any man generally who was not a manual worker as being an 'erudite' who was out to exploit them."[52] David Riesman has correctly noted that political anti-intellectualism may be regarded as a form of the "class struggle," that it reflects the fact that various groups

"feel threatened by . . . the growth of intellectualism," that the powerful enemy is "no longer only bankers, lawyers, drummers [but also] professors, teachers, writers, and artists."[53]

This point suggests anew that the leftist politics of the intellectuals in America does not arise from an actual low status. If political anti-intellectualism is evidence that intellectuals have low status, then the persistent attacks on bankers, Wall Street brokers, and railroad magnates in American history would be evidence that they also are low-status groups—and this is clearly not the case. Attacks on any group often indicate they are regarded as high-status groups, and reflect a kind of populist antagonism to any elite.

A Breakdown of the Liberal Syndrome?

This analysis of the sources of contemporary anti-intellectualism and of the dominant politics of American intellectuals has produced some curious paradoxes. I have argued that anti-intellectualism has been particularly widespread among conservatives because intellectuals have not been distributed more or less equally among the political parties. Conservatism has been virtually eliminated by the nature of the American Creed as a real alternative in the minds of American intellectuals, who have come to regard themselves as underprivileged in comparison with their European counterparts. This feeling of deprivation adds to their reformist zeal, which in turn provokes attacks on them by conservatives, thereby increasing support for left-of-center intellectual politics.[54]

Such a cycle, which would seem indefinitely to keep American intellectuals on the left side and to incite right-wing groups against them, has shown some signs of breaking down in the last few years. As a group, American intellectuals appear to have shifted toward the center, although most probably they remain to the left of that position, while a significant minority have become conservative. There are many circumstances underlying this shift, but one of the most important seems the prolonged postwar prosperity. Another is the reaction of liberal leftist intellectuals in America as elsewhere to the rise of Communism as a main threat to freedom. Faced with a society far worse than the one now existing in the West, but also one which claims to be fulfilling the values of the American and the French Revolutions, such intellectuals, including many of the Socialists among them, for the first time in recent history now are moving

toward a conservative ideology which allows them to defend an existing or a past society against those who argue for a future utopia. Like Burke, they have come to look for sources of stability, rather than of change. The very social classes which the reformist intellectual saw as the carriers of the good society—the lower classes, especially the workers—back the new despotism, not only the despotism of the Left, but, as McCarthyism and Peronism have shown, often that of the "radical right." Furthermore, the success of non-authoritarian forms of leftism itself—the New Deal in this country, democratic socialism in the Commonwealth and Scandinavia—has served to remove programs for economic reform from the category of utopias to that of a reality, whatever its imperfections and inconsistencies.

While changing political events have everywhere destroyed the utopias of the democratic Left and turned their movements into parties of the status quo, the prolonged prosperity with its concomitant improvement of the position of the workers and the intellectuals has reduced the visible rationale for an intense concern with economic reform. The political issue of the 1950's has become one of freedom versus Communism. In that struggle many socialist and liberal intellectuals find that they identify themselves with continuing institutions. This identification with the established order comes hard to those intellectuals who feel called upon to reject conventional anachronisms, and results in a feeling of malaise which takes the form of a complaint that everyone, including the intellectuals, is too conformist. Many American liberals in the 1950's know they should like and defend the society in which they live; nevertheless they have the uneasy feeling that they are betraying their obligation as intellectuals to attack and criticize. Their solution to this dilemma is to go on feeling allied to the Left, to think of themselves as liberals, even socialists, but to vote the Democratic ticket and basically to withdraw from active involvement or interest in politics and to concentrate on their work, whether it be poetry or scholarship.

Finally, it is important to note that the evidence does not support the assumption on the part of the few who still remain on the extreme Left that McCarthyism or other forms of intimidation have silenced the radicals and created a frightened or bought group of conformists. The survey of the attitudes of American social scientists supplies convincing evidence to indicate that those who thought the spirit of the academic profession had been crushed by McCarthyism were

wrong. In general, the liberal social scientists stood up for the rights of unpopular minorities and continued to exercise their right of free expression, even though they felt apprehensive of threats to their intellectual activity. As Lazarsfeld and Thielens remark about the behavior of the social-science professors they interviewed, "There is indeed widespread apprehension among these social science teachers, but in general it is hardly of a paralyzing nature; the heads of these men and women are 'bloody but unbowed.' "[55]

The courage and liberalism of the university professor is in fact constantly reinforced as a result of the high degree of "in-group" social relations. "While outside forces such as legislative committees may have harsh and definite means to do him damage, he cannot underestimate the subtle deprivations to which his immediate professional environment could subject him."[56] Men live in small communities, not simply in the great society, and the small community both reinforces its own attitudes and punishes deviations from group norms. Thus, the liberal consensus within the academic community has served to intimidate conservatives much more than outside prying and criticism have inhibited those left-of-center.[57] Yet the larger social forces that push the intellectual community as a whole in a conservative direction may in the future also reduce this internal consensus on liberal political values, and allow the release of a more latent conservatism than has been apparent.

Perhaps even more significant evidence that the decline of leftist intellectual deviation in America is not primarily a result of coercion may be supplied by a comparison of the situation in the United States and that in other Western nations in which the pressures linked with internal-security programs have been much less. It is noteworthy that the reconciliation between imperfect democratic society and leftist intellectuals is similar in a number of countries.[58] The existence of a vicious totalitarianism that bases itself on the working class, together with the varied effects of prolonged prosperity, have challenged the strength of reformist utopias among American intellectuals. This change in political attitudes may bring a sharp reduction in the expressions of anti-intellectualism, even as it means a decline of the traditional alienation of the intellectuals.

Only time will tell whether a permanent change in the relationship of the American intellectual to his society is in process. In spite of the powerful conservatizing forces, there will still remain the inherent tendencies to oppose the status quo. As Edward Shils has written

recently, "In all societies, even those in which the intellectuals are noted for their conservatism, the diverse paths of creativity, as well as an inevitable tendency toward negativism, impel a partial rejection of the prevailing system of cultural values. The very process of elaboration and development . . . of the potentialities inherent in a 'system' of cultural values . . . involves a measure of rejection."[59] Any status quo embodies rigidities and dogmatisms which intellectuals have an inalienable right of attacking, whether from the standpoint of moving back toward traditional values or forward to the achievement of the egalitarian dream.

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14. H. D. Anderson and P. E. Davidson, *Ballots and the Democratic Class Struggle* (Stanford: Stanford University Press, 1943), p. 119.
15. This study is reported in Alice I. Bryan, *The Public Librarian: A Report of the Public Library Inquiry* (New York: Columbia University Press, 1952). The data dealing with political choice are not included in the printed version of the report, and were secured from a mimeographed version of the same study.
16. John Cogley, *Report on Blacklisting: Vol. I, Movies,* (New York: Fund for the Republic, 1956), pp. 24-46; and *Vol. II, Radio and Television,* pp. 142-162. For a detailed discussion of Communist influence among American intellectuals, see Irving Howe and Lewis Coser, *The American Communist Party. A Critical History* (Boston: Beacon Press, 1957), "The Intellectuals Turn Left," pp. 273-318; see also Daniel Bell, "Marxian Socialism in the United States," in Donald Egbert *et al,* eds., *Socialism and American Life* (Princeton: Princeton University Press, 1952), pp. 351-365.
17. Bertrand de Jouvenal, "The Treatment of Capitalism by Continental Historians," in F. A. Hayek, ed., *Capitalism and the Historians* (Chicago: University of Chicago Press, 1954), pp. 118-120. Talcott Parsons has urged the view that there is a basic conflict between the values of business and those of all professions, e.g., law, architecture, medicine, and so forth: "The dominant keynote of the modern economic system is almost universally held to be the high degree of free play which it gives to the pursuit of self-interest. . . . But by contrast with business in this interpretation the professions are marked by 'disinterestedness.' The professional man is not thought of as engaging in the pursuit of his personal profit, but in performing services to his patients or clients, or to impersonal values like the advancement of science" (Talcott Parsons, *Essays in Sociological Theory* [Chicago: The Free Press of Glencoe, 1949], p. 186). It should be noted that Parsons does not relate this conflict to any specific political consequence.
18. The two studies of journalists cited earlier both call attention to the fact that the majority of reporters interviewed disagreed with the policies of their newspapers, and felt it necessary to "slant their news stories to reflect the wishes of their superiors" (Leo Rosten, *op. cit.,* p. 351; Theodore E. Kruglak, *op. cit.,* pp. 100, 102). An English study reports that the pressures for a Royal Commission on the Press after 1945 "arose from a desire to protect the intellectual freedom and integrity of journalists from the assaults of their employers" (Roy Lewis and Angus Maude, *The English Middle Classes* [London: Phoenix House, 1949], p. 179).

19. Many writers have suggested that specific intellectual occupations are associated with particular brands of politics. It has been argued that the social scientists are "attracted to the left" (Theodore Geiger, *Aufgabe und Stellung der Intelligenz in der Gesellschaft,* [Stuttgart: Ferdinand Enke, 1949], p. 124); that Marxism has "a special appeal for the scientist" (Helmut Plessner, "Ideological Tendencies Among Academic Thinkers," Congress for Cultural Freedom, *Science and Freedom* [London: Secker and Warburg, 1955], p. 178); that historians tend to be conservatives (*loc. cit.*, and Karl Mannheim, *Ideology and Utopia* [New York: Harcourt, Brace & Co., 1936], pp. 119-122). A summary of many early hypotheses differentiating the politics of different groups of intellectuals may be found in Robert Michels, *Political Parties* (New York: Hearst's International Library, 1915), pp. 256-257.
20. See Louis Hartz, *Liberal Political Tradition in America* (New York: Harcourt, Brace & Co., 1955). "The ironic flaw in American liberalism lies in the fact that we have never had a real conservative tradition" (*ibid.*, p. 57).
21. See Gertrude Himmelfarb, "American Democracy and European Critics" (*The Twentieth Century,* 1952, *151:* 320-327) for a critique of the viewpoint of Socialist intellectuals concerning popular culture.
22. Leon Samson, *Towards a United Front* (New York: Farrar & Rinehart, 1933).
23. "With high [intellectual] conservatism . . . excluded by [American] history, all we have left is practical conservatism – the conservatism, not of the professors, but of the industrialists, the financiers, and the politicians" (Arthur Schlesinger, Jr., "Burke in America," *Encounter,* October 1955, p. 79).
24. Melvin Seeman reports in a recent study based on intensive and unstructured interviews with forty assistant professors in the social sciences and the humanities that "these intellectuals use the language and mechanisms of minority status to describe themselves and their situation." See "The Intellectual and the Language of Minorities," *American Journal of Sociology,* 1958, *64:* 27. David Riesman points out that "intellectuals, who, for whatever reason, choose to regard themselves as victimized contribute to the very pressures they deplore. These pressures are not so strong as alleged; thinking them strong helps make them become so" (David Riesman, "Some Observations on Intellectual Freedom," *The American Scholar,* 1953-1954, *23:* 14).
25. P. F. Lazarsfeld and W. Thielens, Jr., *op. cit.*, pp. 11-17.
26. National Opinion Research Center, "Jobs and Occupations," in R. Bendix and S. M. Lipset, eds., *Class, Status and Power* (Chicago: The Free Press of Glencoe, 1953), pp. 412-414.
27. It is interesting to note that studies made in different countries and at different times indicate that the relative prestige of occupations is everywhere similar. Two sociologists, Alex Inkeles and Peter Rossi, have compared the results completed in Japan, Great Britain, the United States, Germany, Australia, and among a sample of Russian "defectors," and they conclude that occupations receive approximately the same rank in each country (Inkeles and Rossi, "National Comparisons of Occupational Prestige," *American Journal of Sociology,* 1956, *61:* 339). Later studies completed in Brazil, the

Philippines, Denmark, and the Netherlands show similar results. Two comparable American studies of the prestige of twenty-five different occupations, one completed in the mid-'twenties, and the other in 1947, found almost identical rankings at both times. Essentially, all these studies indicate that occupations which require high levels of educational attainment (intellectuals and professionals) or which command considerable power (business elite and politics) are ranked high everywhere. For discussion and references see S. M. Lipset and R. Bendix, *Social Mobility in Industrial Society* (Berkeley: University of California Press, 1959), pp. 14, 111.

28. Richard Centers, "Social Class, Occupation, and Imputed Belief," *American Journal of Sociology*, 1953, *58:* 546.
29. See John D. Campbell, *Subjective Aspects of Occupational Status* (unpublished Ph.D. thesis, Harvard University, 1952).
30. See Lipset and Bendix, *op. cit.*, pp. 128-137, for a summary of the various business-elite studies.
31. Lazarsfeld and Thielens, *op. cit.*, pp. 23, 26.
32. "In Emerson's day professors and their fellow intellectuals had not come to be regarded as a special group; they were not then, nor have they ever come to be, looked up to, rewarded, and honored as in Europe" (Merle Curti, "Intellectuals and Other People," *The American Historical Review*, 1955, *60:* 260). It may be that the grass always looks greener elsewhere, particularly to intellectuals who want to prove it is so, and who as important foreign travelers are often involved in exchanges with many sections of the native elite whom they rarely meet regularly at home. Thus, writing in the 1880's, James Bryce tells us that intellectual eminence in America "receives, I think, more respect than anywhere in Europe, except possibly in Italy, where the interest in learned men, or poets, or artists, seems to be greater than anywhere else in Europe. A famous writer or divine is known by name by a far greater number of persons in America than would know a similar person in any European country. He is one of the glories of the country" (James Bryce, *The American Commonwealth* [Toronto: The Copp Clark Pub. Co., Ltd., 1891], Vol. II, p. 621). More recently Raymond Aron, who believes that, all things considered, the position of the British intellectual is superior to that of the French, nevertheless states: "English writers of the *avant-garde* . . . are overcome with rapture when they come to Paris. . . . They at once develop a passionate interest in politics. . . . The last article of Jean-Paul Sartre is a political event, or at least it is greeted as such by a circle of people which, though narrow, is convinced of its own importance." This impression which the English, and need it be added American, intellectuals have of the political influence of their French brethren is, according to Aron, superficial and wrong (Raymond Aron, *The Opium of the Intellectuals* [New York: Doubleday & Co., 1957], p. 218).
33. A French analyst of American intellectuals has recently written: "It seems to me that the attitude of the American intellectual in comparison with his European counterpart is based on frustration and an inferiority complex. I am continually meeting people who tell me that the intellectual in Europe enjoys a position which, if not happier, is at least more dignified than that of

the intellectual in America" (R. L. Bruckberger, "An Assignment for Intellectuals," *Harper's,* February 1956, p. 69).

34. "One thing and perhaps one thing only, may be asserted with confidence. There is no rank in America, that is to say, no external and recognized stamp, marking one man as entitled to any social privileges, or to deference and respect from others. No man is entitled to think himself better than his fellows, or to expect any exceptional consideration to be shown by them to him" (James Bryce, *op. cit.,* p. 168). For an elaboration of these ideas on the subject to American egalitarianism, one which attempts to show how the elaborate efforts of upper-status Americans to establish distinctions of family rank result from the strength of the egalitarian ideology, see S. M. Lipset, "Social Trends in America," in Lyman Bryson, ed., *A Concise Guide to Knowledge* (New York: McGraw-Hill Book Co., Inc., in press).
35. A. G. Nicholas, "Intellectuals and Politics in U.S.A.," *Occidente,* 1954, *10:* 47. Another source of variation in the status accorded intellectuals in Europe and America comes from the differences in numbers. The title "professor" is held by close to 200,000 people in the United States and by a few thousand at most in the larger European states. This partially flows from the fact of a smaller number of universities in Europe, a point to be discussed later, and partly because Europeans limit the title "professor" to a few men in each field per university, often just one. As John D. Hicks pointed out: "In this country we have gradations – assistant professors, associate professors, full professors – and they are all professors. . . . But in the Old World it is different. There one finds no gradations. A man is a professor, or he is not a professor, and if he is a professor, that puts him on a pedestal of some eminence. Most of the teaching staff of an Old World university are not professors at all, and can never hope to become professors" (John D. Hicks, "The American Professor in Europe," *Pacific Spectator,* 1952, *6:* 432).
36. "With his deep sense of class and status, integration in American society is not easy for the *émigré.* The skilled engineer or physician who, after long years of interneship, flunking license exams, washing dishes or laboratory floors, finally establishes himself in his profession, discovers that he does not enjoy the same exalted status that he would have had in the old country. I met several Croatian doctors in the Los Angeles area who were earning $25,000 to $35,000 a year, but still felt declassed" (Bogdan Raditsa, "Clash of Two Immigrant Generations," *Commentary,* January 1958, *25:* 12).
37. "In the U.S., the political people are in Washington, the publishing and theatre people in New York, the movie people in Los Angeles, while the professors and the press are everywhere. (Most Englishmen I have met are not *really* aware that America has no national press, and that the overwhelming majority of university professors live in small towns.) It is quite possible for a man to edit a magazine with over a half-million readers and never to have met anyone of distinction in politics, the drama or music" (Irving Kristol, "Table Talk," *Encounter,* October 1955, *5:* 60). (Emphasis in original.)
38. Lazarsfeld and Thielens, *op. cit.,* pp. 31-32.
39. Irving Kristol, *op. cit.,* pp. 60-61. Kristol has edited *Encounter* in London, and *Commentary* and *The Reporter* in New York.

40. Dwight Macdonald, "Amateur Journalism," *Encounter,* November 1956, 7: 19. For later comments by Macdonald on the same subject, see his letter, "Politics and Partisans," *Columbia University Forum,* Fall 1958, 2: 3.
41. John Fischer, "The Editor's Easy Chair," *Harper's,* March 1958, p. 18.
42. It has also been suggested that the separation of the political capital, Washington, from the intellectual capital, New York, likewise contributes to the feelings of isolation from political power on the part of many intellectuals. "The only type of intellectual who is likely to congregate in Washington is . . . one who has decided to make politics his full time business" (A. G. Nicholas, *op. cit.,* p. 44).
43. It is interesting to note in this connection that the French sociologist, Raymond Aron, attempting to explain the allegiance of a large section of the French intellectuals to Communism in spite of their high status, argues that they feel isolated from power, and legitimately so. "Most of the [French] intellectuals who take an interest in politics are embittered because they feel they have been defrauded of what was their due. Whether docile or rebellious, they seem to be preaching in the wilderness. . . . In the United States, in Great Britain, even in Germany, ideas and personnel never cease to circulate between the economists and the managerial circles of banking and industry, between these and the higher ranks of the civil service, between the serious press, the universities and the government. Most French businessmen have never met an economist, and until recently they tended – confidentially – to despise the species. French civil servants are totally indifferent to the advice of scholars, and journalists have few contacts with either. . . . In this respect no other ruling class is as badly organized as the French" (Raymond Aron, *op. cit.,* pp. 220-221).
44. "Writers occupy a peculiar position in the class structure of American society: they compose what sociologists would call an out-group or rather a collection of such groups. . . . Their incomes are smaller on the average than those of doctors and attorneys, larger than those of clergymen, and roughly equal to those of college professors." See "Prophets Without Honour? The Public Status of American Writers," *The Times Literary Supplement,* 17 September 1954, p. liv. But Raymond Aron tells us that in France, some intellectuals "cast their eyes longingly across the Atlantic, where certain specialists of the written word, whom one would hesitate to call intellectuals, achieve considerable incomes" (Raymond Aron, *op. cit.,* p. 219).
45. The statistics on the composition of the present Senate are from *The New York Times,* 9 November 1958, p. 65, "Cap and Gown Win Favor of Voter – 3 Newly Elected College Professors to Join Faculty of 11 Current Senators." This article also points out that seven other Senators (six of them Democrats) are members of Phi Beta Kappa.
46. It is well recognized, however, that no upper class of modern times anywhere has made such large funds available for intellectual activity. Carnegie, Rockefeller, Stanford, Guggenheim, Ford, and others set new standards through their gifts to universities or through the establishment of foundations. Veblen and others have pointed to these munificent contributions as examples of conspicuous consumption. What is left out of this analysis is the

implication that the support of intellectual activities is assumed as conveying prestige to men of wealth. In his last years, Andrew Carnegie surrounded himself with intellectuals and artists, and concerned himself with their economic problems. In his letter of gift establishing the Carnegie Foundation, he stated that among its purposes was to "do and perform all things necessary to encourage, uphold, and dignify the profession of the teacher and the cause of higher education" (Claude C. Bowman, *The College Professor in America* [Philadelphia: privately printed, 1938], p. 57). In 1919 John D. Rockefeller followed in Carnegie's footsteps by giving $50,000,000 toward a nation-wide movement to pay college teachers more adequately" (*ibid.*, p. 43). With few exceptions, wealthy Frenchmen, Britons, or Germans have not felt the need to support intellectual endeavors on a large scale.

47. E. Digby Baltzell, *Philadelphia Gentlemen* (Chicago: The Free Press of Glencoe, 1958).

48. Richard Hofstadter has perceptively analyzed some of the sources of the leftward drift of the American intelligentsia in which "beginning slowly in the 1890's and increasingly in the next two decades, members of these professions deserted the standpat conservatism of the post-Civil War era to join the main stream of liberal dissent and to give it both moral and intellectual leadership." See *The Age of Reform, op. cit.*, p. 149, also pp. 148-163. See also William E. Leuchtenburg, "Anti-Intellectualism: An Historical Perspective," *Journal of Social Issues*, 1955, *9:* 8-17.

49. Marcus Cunliffe, "The Intellectuals: II The United States," *Encounter*, May 1955, *4:* 29.

50. See Merle Curti, *American Paradox* (New Brunswick: Rutgers University Press, 1956).

51. The British socialists were attacked for following the theories of the impractical Fabian intellectuals, and the German Right has always been hostile to *Kathedersozialismus.* The fact that during most of the twentieth century we have not had many conservative intellectuals has made anti-intellectualism in the United States a natural weapon of the conservatives. But Richard Hofstadter reminds us correctly that American liberal politicians, like the radical opponents of Marx, can be equally intolerant of intellectual opposition. "Our history books tell us . . . that during the Populist-Bryan period the university professors who failed to accept the gold standard economics of the well-to-do classes were often victims of outrageous interference; they do not usually trouble to tell us that when the Populists captured Kansas they raised hob with the University of Kansas in much the same way that they complained of so bitterly when the shoe was on the other foot" (Richard Hofstadter, "Democracy and Anti-Intellectualism in America," *Michigan Alumnus Quarterly Review*, 1953, *59:* 288).

52. Friedrich Engels, "On the History of Early Christianity," in Karl Marx and Friedrich Engels, *On Religion* (Moscow: Foreign Languages Publishing House, 1957), p. 319. A more detailed account of anti-intellectual episodes within the European socialist movement may be found in John Spargo, "Anti-Intellectualism in the Socialist Movement: A Historical Survey," in *Side-*

lights on Contemporary Socialism (New York: B. W. Huebsch, 1911), pp. 67-106.

53. David Riesman, *op. cit.*, p. 15. Riesman is one of the few intellectuals to suggest that an important reason for the presence of anti-intellectualism is that "in the much more fluid and amorphous America of our time, *the writer, the artist, the scientist have become figures of glamour, if not of power.*" (My emphasis.) Lionel Trilling is another who has written about the high status of the American intellectual. See his "Mind and Market in Academic Life," *New Leader*, 9 February 1959, 19-23.

54. The French writer R. L. Bruckberger has argued that "the American intellectual often tends to say that his country has failed him, that she will not give him the honor which is his due, and that he feels like a spiritual exile. *I wonder if the contrary is not true.* Perhaps the American intellectual has failed his country, and perhaps he is more deeply missed than is first apparent. . . . This misunderstanding would indeed be comic if a nation could get along without intellectuals. Yes, the American intellectuals should stop complaining about America. It would be more in order for America to complain about them" (Bruckberger, *op. cit.*, p. 70).

55. Lazarsfeld and Thielens, *op. cit.*, p. 95.

56. *Ibid.*, p. 104.

57. Morris Freedman, "The Dangers of Non-Conformism," *American Scholar*, Winter 1958-1959, *28:* 25-32.

58. In Britain, the London School of Economics, once regarded as a stronghold of the Labour Party, now contains a Conservative voting majority among its faculty, according to a number of reports. In Canada, the *Canadian Forum*, the organ of socialist writers and academics for three decades, ceased being a socialist magazine within the past five years. In Scandinavia one may point to similar changes.

59. Edward Shils, "The Intellectuals and the Powers: Some Perspectives for Comparative Analysis," *Comparative Studies in Society and History*, 1958, *1:* 8.

Comments On "American Intellectuals: Their Politics and Status"

I. By Arthur Schlesinger, Jr.

Mr. Lipset's able piece contains suggestions and insights which should valuably temper the self-denigratory passion of the American intellectual. But, in his determination to correct the picture, he may well be pressing his argument too far. The crux of his case lies in the section "The Real Status of the Intellectuals." Here he seeks to show that, despite the conviction of the intellectual that no one loves him, in fact the American people think he is wonderful. The evidence cited to prove what is the crucial link in his argument seems to me profoundly inadequate.

His essential evidence consists of public-opinion polls taken in 1947 and 1950. All these polls prove, so far as I can see, is that people in 1947 and 1950 thought they thought well of the intellectual occupations, or that they thought they *ought* to think well of the intellectual occupations. Public-opinion polls asking straight-out questions often throw only inadvertent light on what people *really* think. Such questions, of course, are ultimately unanswerable; but even an historian can suggest sources which a sociologist might use to supplement the polls. Consider, for example, the image of the intellectual or the professor in the popular media—the television program, the movie, the popular magazine story, the political cartoon, the comic strip. Surely the intellectual can find only meager comfort in the way he is conventionally perceived and represented in the mass media. He is customarily shown as ineffectual, impractical, fussy, and comic; or else as decadent, affected, and sinister. These images would seem to me

more revealing as to how the intellectual is viewed in our society than what people respond when asked direct questions.

In short, I think there is a little more to the intellectual's view that he is regarded with condescension in American society than Mr. Lipset would allow. But what I dissent from most in his piece is the assumption that the attitude toward the intellectual in the United States is a fairly stationary phenomenon. What would seem evident to the student of history, I would think, is that the attitude toward the intellectual is cyclical—that at some times he is taken seriously and at others he is not. He was taken seriously in the first decade of the century and in the nineteen-thirties; he was not taken seriously in the nineteen-twenties or 'fifties. In general, when the business community is in control of the national political government, the intellectual is shut out, mocked, and rejected. When the coalition of non-business forces—a coalition of which the intellectuals ordinarily form an indispensable component—is in control of the national political government, the intellectual has a much higher status.

One trouble is that this cyclical process tends to aggravate the tensions between intellectuals and businessmen. Thus the intellectuals, who were so badly kicked around by the businessmen in the 'twenties, promptly did their best to kick the businessmen around in the 'thirties. The early 'fifties were classic years of the businessmen's revenge against the intellectuals. When sometime in the 'sixties the intellectuals come back to power, I hope they will remember the self-defeating character of these past exercises and show self-restraint in face of the temptation to get their own back.

Since Mr. Lipset is usually far more aware of the historical dimensions of problems than most sociologists, I wish he had devoted attention to the fluctuations in the power and prestige of the intellectual.

II. By KARL W. DEUTSCH

MR. LIPSET'S article reaffirms his high standards of analysis. It advances challenging ideas, it shows a wide command of the literature of research studies and data, and it deals with highly relevant problems. In the space available I cannot comment on the many things in the article with which I agree, but I shall concentrate instead on my reservations. This enforced imbalance should not obscure my appreciation of this stimulating and worth-while piece of work.

For example, I do not agree that in point of fact feudalistic societies ordinarily pay a high respect to intellectuals. Historically this has not always been the case. Again, if some American intellectuals feel deprived, they may well be protesting against what seems to them a distorted balance between achievement and reward. The pattern of American culture teaches us to expect on the whole that a man's reward will not be too far out of proportion to his ability and his efforts; the gap between the rewards for scientists or scholars and those for businessmen does not fit in very well with this creed. Further, if we consider intellectuals as the owners of invisible capital, then they, like the owners of tangible property, can justly claim the right to returns proportionate to their investment in years of training. The interests of American intellectuals are less protected than are such goods as factories and machines. Such an attitude in intellectuals might account for some of their recurrent conflicts with Communism as well as with any anti-Communist regimentation; they do not want to have their minds expropriated under any pretext.

The one reservation I can develop here concerns Mr. Lipset's definition of "intellectuals." He defines them by occupation as the persons whose job it is to create or distribute "culture," or, at the periphery, persons "who apply culture as part of their jobs—professionals such as physicians and lawyers." Later in the article he adds engineers, bankers, and occasional business executives. This definition does not deal fully with the problem of publishers, executives in the mass media of communication, and personnel in advertising—that is, with the vast number of precisely those people who do create and distribute the mass culture about which Mr. Lipset's "intellectuals" tend to complain. Either the people who create and distribute the culture of "Winston tastes good like a cigarette should" are not intellectuals, in which case Mr. Lipset's definition of intellectuals as creators and distributors of culture should be revised, or else they are to be considered intellectuals, in which case the studies and the samples cited in the rest of the paper are biased by an unrepresentative selection.

The trouble may be in the difficulty of defining intellectuals in terms of a social function, rather than in terms of an inner attitude. One might consider an intellectual a person who takes a wide range of abstract symbols and ideas seriously, and who does so in relation to a wide range of topics outside his immediate field of professional specialization. In this sense, lawyers who spend very little time on any abstractions other than those of the law, or engineers who pay lit-

tle attention to any symbols other than those used in engineering computation, or editors of papers who do not care seriously for anything except the advertising revenue and circulation figures of their papers, are not intellectuals in terms of inner attitude. In order to be an intellectual you have to pay attention to cultural symbols and abstractions outside your own professional field; you have to be willing to pursue the implications of ideas and to consider them relevant; and perhaps you have to have some sense of integrity, at least enough to know whether or not you are facing the question of making a compromise about an idea in a particular situation.

Of course Mr. Lipset's functional definition of intellectuals overlaps the definition in terms of attitude which was just proposed, but since the two definitions do not overlap completely we are actually dealing with four groups of people: first, there are persons who are full-time intellectuals both by job and by inner attitude; second, there are volunteer intellectuals—people who do not hold intellectual jobs but who read books, pay attention to art and to ideas, and feel that these things matter to them and ought to matter to their community; third, there are commercially oriented intellectuals—people who are incumbents of intellectual occupations, but who have a stockbroker's or leather merchant's attitude to the goods they sell; and finally, of course, there are non-intellectuals—those whose occupational and personal involvement in matters of abstract symbols and ideas is relatively small. The first of these four groups is clearly within Mr. Lipset's discussion, and the fourth group is clearly without it, but it is possible that the second and third groups, the volunteer intellectuals and the commercial intellectuals (or the volunteer non-intellectuals, so to speak) are too numerous and too important to be disregarded. Human beings have not only social roles and functions; they have personalities and memories, and those may be more important in the life of a man than is the job he happens to occupy at a particular moment. In a mobile society such as that of the United States this should apply even more strongly. It would be interesting to scan the literature of psychological and sociological research in order to find out whether or not the inner memories and attitudes of intellectuals do not outweigh to a significant extent the "other-directed" requirements of their jobs in moving them to protest.

In the long run, American intellectuals may well succeed in achieving a better balance in our culture between man's visible and invisible investments. As these adjustments are being worked out through

democratic processes, the articulate dissatisfaction of some of our intellectuals may well be making a constructive contribution.

III. By David Riesman

Mr. Lipset performs a service of clarification in putting the situation of American intellectuals into a cross-cultural context and in suggesting what price we would have to pay if traditional European patterns of deference to an elite were to be adopted here—an entirely hypothetical possibility. In *The New York Times*, the sensitive writer James Baldwin recently described an encounter with a waiter in a Paris café, and the lack of resentment on the waiter's part for Baldwin's superior status. In the fluid American setting, in which such contrasts in station are much less conventionalized, such a rapport as this is correspondingly rarer—a loss to waiters, perhaps, as well as to writers. The quest for status gains much of its power from the fact that we do not, whether writers or waiters, enjoy our work enough, and that our eye therefore is constantly on others, their perquisites, their prestige.

The prestige that matters, however, is not only one of the adult world, as reported in the empirical studies Mr. Lipset cites, but also one of the not entirely congruent rankings of the schoolyard. It is my impression that in high school and in college, the prospective American intellectual faces a problem that does not arise in quite the same form in other countries: he may have to confront bullies who torment him for not being "male," for being a sissy—and sometimes girls too will not define him as a member of the opposite sex. If, like so many American professional men, scientists, and teachers, he is simply more intelligent and better at schoolwork than his fellows (without being an intellectual in the sense of having a special affective relation to ideas), such a setting may confirm in him a cult of masculinity. Adult intellectuals, of course, succumb to this version of anti-intellectualism, whether in the compulsive toughness of some novelists, or in the intransigent scientism, the belief in "hard facts," of many social scientists. These attitudes, to be sure, have other roots as well, including hostility to the decaying fortresses of seaboard gentility on the part of the upwardly mobile.

Many novels show us that the sensitive European intellectual may have a rough time at school also, but "maleness" is less of a fighting

issue, and social class and the family foyer are a better protection against hoodlumism than in this country. As Mr. Lipset says, the vulgar tycoons of the late nineteenth century no longer play a major role in large corporate business, but the boys who dominate the schoolyard linger on, in fact and memory.

This background does not explain why many burly professors who were athletes in their youth belong to ADA and believe themselves underprivileged and alienated. Yet if one studies the differences among intellectuals along the lines Mr. Lipset indicates, some clues may be found. Just as engineers prove to be far more conservative than scientists, so may orthopedic surgeons, who are good with their hands, prove more conservative than pediatricians and psychiatrists. Similarly, intellectuals, writers, and artists who have grown up in small-town high schools may feel more alienated than do those who have gone to the High School of Music and Art or other New York City public high schools that have attracted the ambitious children of immigrants.

As more and more people attend college and become at least moderately tolerant and enlightened, the problems ahead of us may lie less in parataxic misunderstandings of the relative position of intellectuals than in an increasing complacency. It is important now for intellectuals to express dissatisfaction—not with their own relative status, which is good and getting better—but with the unpromising perspective of the future. In talking with fellow intellectuals about the work of the Committee for a Sane Nuclear Policy, for example, I have found many of them too closely linked in fact or feeling with current bipartisan rationalizations. Far from feeling "alienated" or "irresponsible," they feel close enough to power to reject identification with an attitude that might be considered "unrealistic," or, if not pro-Soviet, neutralist and anti-American. Another group of intellectuals, relatively few in number but important in influence, have become "braintrusters" for the "new American Right," either in penance for their earlier mistakes or else in search of a seemingly stable orthodoxy.

The great majority of intellectuals, like other Americans, have only peripheral political interests. They do not conceive of their role in society as implying an obligation to warn that society of impending danger. Rather do they appear to assume that their world and their specialty will continue unthreatened indefinitely. There has been a marked failure on the part of conservative intellectuals to preoccupy

themselves with conserving the planet rather than gaining this or that bargaining point of big-power rivalry. In this connection, I have often been grateful for those residual left-wingers whose reconciliation with "imperfect democratic society" is still far from complete. I find here a greater paradox than is indicated by Mr. Lipset: were not intellectuals of more use to this country when they had less use for it?

IV. By Talcott Parsons

I HAVE FOUND the Lipset article of great interest. It presents a complex argument and considerable data on complex issues. I find myself more in agreement than in disagreement, but I do not think it very profitable to argue in general for or against the author's position. Rather, I should like to take up, with the extreme brevity enforced by limitations of space, three interrelated issues on which I think Lipset is insufficiently clear.

If we leave aside for the moment the important question of definition, the first point concerns interpretation of the apparent paradox, which Lipset strongly emphasizes, that intellectuals in American society do in fact enjoy high status, but behave politically more like the lower status groups in their alignment with labor, with the lower income groups, and more generally and in varying degrees with the political left. They also consider themselves to be accorded low status by other groups. To the sociologist this strongly suggests a phenomenon called "relative deprivation" by S. A. Stouffer and his coauthors in *The American Soldier*. The essential point is that intellectuals, through the general upgrading of the population in educational level, through the enormous development of the sciences and their growing practical applications, and indeed through the development of mass communication outlets for "high culture" such as literature and history through paperback sales, classical music, etc., have been a group with realistically rising importance and status. Relative to most other groups, not excepting businessmen, my impression is that they have been rising more rapidly. But precisely because of this fact, they tend to feel that they have not risen fast or far enough. It is because of, not in spite of, a high and rising status that most intellectuals, being energetic and ambitious people, are dissatisfied with what they have. Though Lipset hints at it, for example in emphasizing that anti-intellectualism is a symptom of the real importance

of intellectuals, I am surprised that he does not bring out this interpretation sharply and clearly.

A second important point concerns the degree of differentiation and specialization within the intellectual world. Lipset particularly emphasizes the quantitative extent of these groups in the United States, by contrast, for example, with any Western European society. But in addition, there are many different *kinds* of intellectuals. Therefore the "intellectual community" tends to lose its solidarity in the sense that "everyone knows everyone else." Not only do fewer intellectuals know fewer nonintellectuals, like political figures, business people, etc., but they tend to know those intellectuals whose interests are relatively close to their own. At the same time, it is doubtful whether the average intellectual knows fewer people than he did before, and the circles of acquaintance are very widely extended and interweave in numerous overlapping ways. Geographically, for example, I, like many of my colleagues, know many social scientists distributed all over the United States and much of Europe.

Differentiation and specialization put a particular strain on one group of intellectuals, those who tend to regard themselves as guardians of "general culture." These intellectuals are above all the humanistically inclined, both inside and outside the colleges and universities. It is within this group that the elements of ideological alienation from American society have been most pronounced, and they have expressed themselves in such themes as the deprecation of "mass culture" and of the alleged tendency to "conformism." This group shares in the general rise in prestige of all intellectuals, but its members suffer one very important special kind of deprivation. Their *relative* place in the total world of culture has inevitably been declining by the very process of the differentiation of that world. Furthermore, they have traditionally been the intellectual experts on things human, and have had to face the invasion of their fields by a whole new crop of more technical and more specialized disciplines that have appropriated parts of this area, notably the social and psychological sciences.

As the trustees of an older tradition from which newer ones have been differentiating, groups under this type of pressure are very apt to develop a nostalgia for a past era when they did not face this competition, and for other less differentiated societies such as exist in both England and France. It seems to me that it is in such groups that the relatively new crypto-conservatism of intellectuals' attitudes which Lipset notes has its center.

Lipset speaks of the problem of egalitarianism and tends to link this concept particularly with political egalitarianism. In my opinion the political "leftism" of American intellectuals has been above all oriented against the conservatism of the business classes, who have in fact been highly ambivalent about intellectual values. The business interest, in a sense not true of most European societies, has indeed been at the focus of American political conservatism. In contrast, one could refer to a situation in our own past in which the process of differentiation in the intellectual world itself had not gone so far as it has recently, and to a more recent state of affairs in Europe, where a narrower and less differentiated intellectual elite have shared high status with a more or less aristocratic upper group.

It is one of the apparent paradoxes of American society that intellectuals in this sense have shared with nonintellectual upper-class groups a general tendency toward the political left—witness the Roosevelts and the Achesons. They have had in common a strong sense of their own importance and a distaste for the symbols of a "business civilization."

One of the main points, to my mind, is that the American intellectual world is not a single entity. One could have wished that Lipset had attempted to delineate its internal differentiation in relation to his problems more sharply. My own suspicion is that the crypto-conservatism of the humanistic decriers of mass culture is only one strain. The elements that are more involved in technical specialities and are more dependent on patterns of equality of opportunity in the occupational arena, as in the sciences generally, are not likely to be susceptible to this appeal in the long run, nor are they in the near future likely to join with the principal business groups in a trend to political conservatism.*

V. By Daniel Bell

If one traces the structure of Mr. Lipset's article, it is hard to know where it leaves one. We learn that most intellectuals are liberal and leftist, and that the business community is not. Therefore, there is

* Another aspect of the problem that cannot be entered into here concerns the conditions under which groups will tend to support vigorous positive action by government. Political conservatism in this country has mainly had the connotation of opposition to such action. Intellectuals seem unlikely to develop a laissez-faire ideology which supports this position.

bound to be a hostility on the part of the businessman to the intellectual, and this hostility is reflected in the press. The "real" status of the intellectual is high, since an opinion poll shows that the occupation of college professor ranks high in prestige. Yet the intellectual himself thinks of his rank as low, since he compares himself somewhat unfairly with the European intellectual. Yet there are so many more intellectuals here than in Europe that it is hard for such Americans to get to know one another; furthermore, though they may be concentrated in groups, at the same time they are widely dispersed. In midsummary, Mr. Lipset writes, "Much of the self-deprecating image projected by the American intellectual to justify his feelings of alienation from his society turns out to be invalid." But then it appears that Americans as an egalitarian people respect no one to any high degree, least of all intellectuals, despite their elevated status on the prestige continuum. Still further, anti-intellectualism arises out of the special claims made by intellectuals for their role, claims which the masses everywhere, not only in America, are bound to resent. In the end, this situation may change so as to "bring a sharp reduction in the expressions of anti-intellectualism," since the intellectuals are no longer so far to the left.

If Mr. Lipset is simply being descriptive, these contradictions might be the contradictions of reality. Actually, however, one feels that the writer is in contradiction with himself, and is somewhat forcing his data and his conclusions. In talking of the "real" status of the intellectual, he is also saying by implication that intellectuals are not so justified in feeling alienated from the rest of the population, and that if they want to be "loved" they should not assert superiority. One gets the impression, therefore, that Mr. Lipset is chiding the intellectuals while also seeking to account for the sources of hostility to them. His private intentions, I believe, have led him to accept too many things at face value.

How does one account for the standing of intellectuals on the National Opinion Research Center poll — one of the few on a nationwide basis in contemporary history, and one that has been mangled for many purposes in quasi-ideological debates? The simplest answer is that the poll gave a formal response, as meaningful or as meaningless as the American creed itself: in other words, a set of ratings to which one gives formal assent, yet which in practice are inverted in many ways. Mr. Lipset's other evidence belies the "real" meaning of these ratings when he says, in effect, that because of their

egalitarian creed people do not acknowledge the superior mental competence of the intellectuals. The professional knowledge of a doctor is so acknowledged, but the qualifications for intellectual judgment are much less so. This is explainable because in matters of opinion one man's preference is as good as another's. And art, politics, and philosophy for Americans are matters of opinion.

One must distinguish between structural changes in society and changing valuations. Surely there are many more intellectual "places" now. One need only compare the limited opportunities for the graduate student in the 'thirties (or those for most workers) with the opportunities in the 'fifties. This expansion is a consequence of the expansion in research, education, administration, and so forth. Too, there is a change in business ethics, the old ways having been replaced by professionalization with its codes of behavior. However, the increase in "place" and the rise of professionalism do not as yet indicate a *respect* for ideas, which, after all, gauges the real status of an intellectual community. Perhaps one reason why American intellectuals make invidious comparisons between themselves and their English compeers—and the degree of Anglophilia in America is extraordinary—is the respect for learning presumed to exist in British university life.

My difference with Mr. Lipset arises ultimately out of the idea of alienation and its meaning as an attitude taken by intellectuals. Mr. Lipset is somewhat troubled by the idea that intellectuals are alienated from American society, particularly when that society has been hospitable in offering them many places. Those who somewhat tentatively constitute the beginnings of an official and responsible culture (e.g., the foundations) fear this alienation will be misunderstood by intellectuals in other countries, particularly in Asia and Africa, and that this will reinforce anti-American feelings at a crucial time in the world race to win the loyalty of free peoples to a democratic ideal. One can understand this concern, but it is, I believe, misplaced. For one may be alienated from many of the values of society, and yet be a part of that society: the critic is no less indispensable to literature than is the writer. Alienation is a constituent element of a viable culture, and when allowed to exist freely as an attitude it proves the vigor of that culture. An attitude of alienation is one of criticism and skepticism, of acknowledging a relationship while being detached. It is one of the necessary safeguards for intellectuals, as a permanent posture, lest they become committed to the winds of ideologies and

blow hot and cold with them. The attenuation of the power of ideology, I believe, is one of the positive signs of the sanity of the intellectual. But his strength also depends upon his willingness to refrain from being an ideologue – his willingness to be, in that sense, alienated.

Observations on the American Economy

SUMNER H. SLICHTER

THE AMERICAN economy is a good economy. It has three principal economic characteristics that make it good: it is highly productive; it distributes the fruits of production broadly; and it provides a rather stable demand for goods.

No other economy in the world comes close to matching the American economy in productivity. Output per capita in the United States is roughly one-third greater than in Canada, twice as large as in Britain, Australia, or Sweden, and about three times as large as in France.

The high productivity of the economy is reflected in the growth of education, the growth of home ownership, the growth of leisure, and the growth of the ownership of semi-luxury or luxury goods. The proportion of persons fourteen to seventeen years of age enrolled in high schools or colleges has increased from 6.7 per cent in 1889-1890 to 88 per cent in 1956. Three-fifths of the dwelling units in the United States in 1956 were occupied by the owners. In 1940 the proportion was 43.6 per cent. The forty-hour week is a standard work week in most industries outside agriculture. The number of weeks of vacation taken by workers is estimated to have doubled between 1946 and 1956. About nine out of ten homes have electric washers; more than nine out of ten, electrical refrigerators; three out of five, vacuum cleaners; nearly nine out of ten, television sets; and three out of four families own automobiles.

The cause of the high productivity of the American economy is not found fundamentally either in the abundant natural resources of the country or in the advanced technology of American industry. Other parts of the world have rich natural resources without the high pro-

ductivity of the United States. Hence, attempts to explain the high productivity of American industry must also explain why technology here is so advanced. The immediate cause of the high productivity of the American economy is the resourcefulness and persistence with which individuals in the United States pursue economic gain. Two principal conditions account for this vigorous pursuit of gain: the unique freedom of individuals in the United States from restraint by traditions and institutions, and the extraordinary abundance of economic opportunity. In no country of the world do individuals feel such small control from institutions, organizations, and traditions as in the United States. There is little social stratification in the United States, so Americans do not occupy stations from which it is regarded as unseemly for them to attempt to rise.

The extraordinary abundance of opportunity that has been so largely responsible for high productivity is the result of a variety of conditions. During much of the country's history, opportunity has come because the large and rich continent was undergoing development. Opportunity was increased by the rapid growth of population, for which immigration was partly responsible. In addition, climatic and economic conditions in most parts of the country were favorable to self-employment, which in turn is particularly favorable to the development of economic ambitions. The American economy has always had a great capacity to produce entrepreneurs, and it still has that capacity.

Of late years the economy has gained a powerful new source of opportunity—namely, technological research. Technological research is a direct source of greater productivity, but its indirect effects upon productivity, as a result of the opportunities it creates, are probably more important than its direct effects. Most of the development of specialized technological research has occurred since 1930. Measured in terms of the number of scientists and engineers devoting full time to technological research, this activity is more than five times as large as it was in 1930, and measured by the ratio of research expenditures to the gross national product, it is about thirteen times as large. In 1956 the annual budget of technological research, according to the estimates of the National Science Foundation, was about $9 billion a year. At the present time this budget is running more than $10 billion a year. Research has been growing so rapidly that it expanded right through the deep depression of the thirties and it continued to expand through the small recession of 1958.

The great need of research is sophisticated consumers—consumers who are interested in the real merits of products. For this reason most of the research work is concentrated in less than a dozen industries, and its extension into other industries depends upon the development of an interest among consumers in the merits of products. The reason why the automobile industry, one of the largest of industries, lags in research is that cars are sold on the basis of rather superficial characteristics and that most buyers have not been much interested in the real quality of cars. The great enemy of technological research has been the advertising industry, which does not seek to create well-informed buyers but relies upon "hot air" to sell goods.

The tremendous energy and interest in getting ahead that the people of the United States have displayed show how grievously production in many countries has suffered because traditions, social stratification, and institutions have prevented hard work from earning the doers a rich reward.

The American economy has distributed the products of its industry widely. In fact, the United States stands out among the countries of the world because of the dominance of the middle class. Society in America is not sharply divided between a few very wealthy, who own most of the land and capital, and a large propertyless proletariat. In 1955, nearly three-fifths of the families and unattached individuals had incomes of $4000 a year or more—in fact, 44 per cent of them had incomes of $5000 or more. The middle class tends to grow relative to the community as a whole. Thus, between 1910 and April 1958, the number of common laborers in the United States dropped from 8.9 million to 5.7 million, but the number of professional and technical workers, managers, officials, and proprietors increased from 10.3 million to 16.8 million, and the number of craftsmen more than doubled, rising from 11.7 per cent of the labor force in 1910 to 13.4 per cent in April 1958.

The strong tendency of the economy to produce a middle class is the result of several causes. Vigorous efforts of business enterprises to expand and strong competition for markets keep high the demand for labor and limit the opportunity for property-owners to make monopolistic profits. As a result, the share of the national income going to property has been dropping for some years and the share of labor has been rising. The demand for workers in middle-class occupations is enhanced by technological change, which increases the need for technicians and for skilled workers to operate

and repair equipment, and by rising per capita incomes, which increase the demand for many kinds of professional services provided by middle-class workers—doctors, dentists, teachers, salesmen, actors, musicians, nurses, writers, reporters, cartoonists, editors, and others.

There are several reasons why the economy is stable. One is the great importance of government spending, which goes on to a large extent independently of the business cycle. A second influence is the powerful trade-union movement that tends to raise wages even during recessions. Since the demand for labor in the short run is inelastic, wage increases tend to increase payroll disbursements and thus to increase personal incomes and personal consumption expenditures. In the third place, the technology of American industry introduces into many parts of industry long-range plans that must be executed more or less regardless of the business cycle. Finally, the rapidly growing technological research has greatly increased the number of industries in the economy, and this in itself is a stabilizing influence. It is difficult, if not impossible, to eliminate fluctuations in the spending of individual industries on plant, equipment, and inventories. Hence, each industry has cycles more or less its own, depending upon the value of the accelerator and the multiplier in the particular industry and upon the sensitivity of the investment plans of the industry to outside events. The important point is that no two industries have the same cyclical patterns or the same sensitivity to outside events. The larger the number of industries in the economy, the greater is the chance that the upward and downward movements of the economy will be sluggish resultants of averages derived from the nonsynchronized cycles of the many industries of the economy. Hence, by adding to the number of industries, technological research tends to moderate the cyclical movements of the economy as a whole.

The American economy has had important effects upon men's thinking and their scale of values. It has strengthened the democratic philosophy. Many European observers in the early nineteenth century thought that the American experiment of more or less universal suffrage was bound to fail – that irresponsible demogogues were bound to take over the government. But democracy in the United States has worked fairly well, and for this result the American economy is partly responsible. The economy has enabled men to afford at least a modest amount of education; it has enabled them to accumulate property so that they feel a stake in things; and it has reduced political conflicts by encouraging men to seek economic

gains through business activity rather than through control of the government.

Perhaps the most important contribution of the American economy to a better civilization has been its influence in winning acceptance for the philosophy that "the good life" can and should be made available to all members of the community rather than be reserved for the privileged few. This is a new idea in the history of the world. Indeed, success in opening the good life to tens of millions of citizens is already causing some people to see new problems and to have new worries. For example, concern is expressed as to whether the rapid increase in college enrollments is not likely to undermine educational standards. Undoubtedly, a rapid influx of students with widely varying abilities creates problems for colleges and universities, but the growing demand for a college education does not create a problem for the community as a whole. It is a good thing, not a bad thing, that a growing proportion of the population wishes to continue in school until past the age of twenty. The rising demand for college work is more of an opportunity for the educators than it is a problem. A community that must worry about the growth in college enrollments is indeed fortunate. It is making good progress in opening the good life to all of its members.

The American economy is about to encounter strong economic competition from Russia. The new Russian seven-year plan, announced in November 1958, does not contemplate a faster economic growth for Russia; it does, however, contemplate that a much larger proportion of the Russian output will be made available for civilian purposes. Having attained military equality with the United States (if not military superiority to the United States) in a surprisingly short period of time, Russia feels able to begin to satisfy the growing demands of her people for consumer goods.

Many people believe that the growing economic competition from Russia requires no policy changes or policy developments by the United States. They ask: what harm does it do if Russia equals us or surpasses us in the output of consumer goods? Certainly a high standard of living in Russia does not do the people of the United States any harm. In fact, if it strengthens the desire of the Russian people for peace, it does us good.

Certainly, economic competition with the Russians is far different from military competition. In military competition it is vital that we hold our own. In economic competition holding our own is not

vital but it is, nevertheless, important. If Russia makes an excellent record of increasing her productivity, while we make a poor record, our economic and political institutions will be judged as inferior to the Russian institutions. Hence, the growing economic competition from Russia requires that the United States increase its interest in raising its productivity and in making full use of its resources.

The outcome of the economic competition between Russia and the United States will depend in large measure upon the use of specialized technological research. Rapid as has been the development of technological research in the United States, it has grown even faster in Russia. Furthermore, Russia is turning out many more technically trained men than is the United States. Unless the United States greatly increases its interest in science and technology, it will not be many years before the Russians have a considerably larger force of scientists and engineers than the United States possesses. If this happens, the economic competition between the United States and Russia will be won by the Russians.

Economic Policies for a Leader of the Free World

SOLOMON BARKIN

AMERICA'S responsibilities for planning its economic future transcend its direct interest. This nation is a leading member of a loose, non-Communistic world alliance. In this era of competitive coexistence with the Sino-Russian bloc, America's goals cannot be fully attained, and its survival will not be assured, unless the other nations in the Free World advance in similar directions. The assurance of the continued growth of these other nations, their realization of objectives comparable to our own, and the security of all the segments of the Free World bloc, are inseparably linked with our own future.

Most nations of the non-Communist group require assistance for their development. To emphasize the democratic and humanistic purposes in their national life is as important to them as it is to us. The very meaning of their absence from the Sino-Russian bloc is that they have assigned the highest priority to these values. The leaders of these nations must produce a real accomplishment in these fields. Security must mean growth, and growth must produce benefits for the people. This is the pattern we wish to counterpose to that of the Communist world. Failure in bringing immediate improvement in the economic lot of these peoples and in assuring their democratic rights will only becloud the differences between the two world blocs, and weaken the hold of the Free World on its following. America's responsibility is to assist these countries to develop a realistic economic and political pattern in harmony with democratic rights and liberties.

Our second major obligation is to maintain the military strength of this world group. Without adequate defenses to offset the military might of the competitive bloc, we shall be at its mercy. There must be a balance of armament or, hopefully, a superiority of might in

the hands of the Free World. Only in this manner can we ensure peaceful coexistence. Military preparedness must be maintained while sincere efforts are made at reaching an agreement on freezing nuclear armament and providing safeguards against surprise attacks. A military balance will give the non-Communist world the time to develop. An American economic policy which fails to provide adequately for the military needs of our nation and its allies, and fails to assist all other countries in their economic and social development, necessarily endangers our own survival.

Domestic Development Imperative

While our international military obligations must necessarily get the highest priority in our economic budget, fortunately our resources and rate of growth allow for the concurrent continued expansion of our internal economy, advance in the standard of living, and a fuller realization of our democratic and humanistic goals.

The assurance of maximum growth as outlined in the Employment Act of 1946 is not only important as a national objective to enable us better to help our people and allies, but also is imperative in the present cold war. Our rate of economic progress is a constant target of comparison for the Iron Curtain countries. Our standards are models for them. They are seeking to match our achievements. They have determined to reach comparable standards in many fields. If we waste our resources and manpower and lag in our progress they will overtake us. The defeat will be as real as any on the fields of battle. More profoundly, it will be an evidence of deficiency, a confession of inadequacy, and a display of a lack of will to survive. Economic and social growth have become pre-eminent necessities in the race between the competitive blocs. The government has the responsibility of promoting maximum employment, production, and purchasing power.

Unemployment and Underemployment

Recently we lost a significant round when our nation suffered the wastes of a recession. The Communist bloc forged ahead. Instead of pressing hard to achieve full recovery, maximum employment, and production, there is continuing approval in business and Administration circles of a high level of unemployment as necessary to control inflation. Price stability has gained a higher priority than

maximum employment. Even if the tactic of high unemployment were an antidote to inflation, which it is not, it would be an improper choice to make, particularly in view of our large domestic and world burden. While our economy operates at less than maximum capacity, the costs of foreign assistance are more onerous.

No one is mistaken about the nature of the current recovery. Few responsible economists will predict maximum employment even within a year. While the seasonally adjusted rate of unemployment in March 1959 was 5.8 per cent, and the number was 4.4 millions, both of these are likely to rise in late spring and reach a high toward the end of the year. In March 1959 there were 391 labor markets with substantial labor surpluses, and of these, 121 had such chronically high unemployment as to be classified as distressed communities. Eighteen of these were located in the New England states. Moreover, most chronically distressed communities have been in this condition for several years, and even far-reaching national recovery is unlikely to revitalize these areas sufficiently to graduate them into a moderate unemployment category. The great need is for more attention to programs of economic expansion as well as for policies for effecting greater stability.

But the present federal Administration is unlikely to focus its attention on stimulating further economic recovery. Although in the last election 37 of the 47 changes in party representation in the House of Representatives occurred in districts with substantial labor surplus, which clearly pointed up the people's dissatisfaction with the Administration's frank avoidance of governmental programs for further economic stimulation, the orthodox emphasis continues on economy and monetary policies. The concern is primarily with preventing inflationary trends even at the price of high unemployment. While public expenditures and private investment will spell higher activity in the year 1959, the sufferance of less than maximum employment represents a loss of economic wealth and well-being which we can ill afford. A large-scale public program of activities is necessary to close the economic gap.

Inflationary Threat Made the Central Issue

The current accent on programs for price stability ironically comes at a time when prices have been stable since April of 1958. The drop in the price of food is offsetting the creeping rise in the prices of other commodities and services. An alarm over inflation in the United

States is being voiced at a time when international price indexes point downward. The prices of international raw materials continue low, with highly unfortunate effects upon the economies of raw-material nations. They are awaiting full recovery in the United States and Europe to increase the demand for their commodities.

Despite this stability in our price level, the anxiety over inflation is widespread in our national government and in the business and financial community. The former is, of course, somewhat chagrined at its own role in stimulating the fears of inflation. It abetted the wholesale shift of liquid funds into the speculative stock market, forcing up interest rates and thereby increasing the cost of governmental loans. These developments abruptly halted the program for converting short-term into long-term loans. The federal authorities are obsessed with their own responsibilities for financing the deficit of ten or more billion dollars, though a substantial part of it is for the purchase of agricultural surpluses and mortgages rather than new economic activities. A determined, frantic effort is being made to cut federal expenditures, irrespective of where it interferes with the nation's growth and recovery.

But there may also be a political motive for this alarm over rising prices, initiated in May 1958 and reinforced by a reversal in federal policy the following August. It originates with the desire to lay the blame for rising prices on the American trade-union movement. This was the theme of the Committee on Economic Development's statement on inflation in May 1958, and it has been voiced by other business and economist sources. It was an active theme in the 1958 elections. In fact, a number of men attempted to explain the behavior of prices during the recent recession in terms of trade-union strength. Unfortunately, these spokesmen did not clearly indicate that the rise was largely associated with the continuing increases in food and agricultural prices induced by bad weather and federal policies concerning agricultural prices and production.

The problem of rising prices is a continuing one, and it deserves real attention. Our current economic institutions are likely to foster a creeping inflation. If we seek price stability we shall need new techniques for control. Present monetary policies and techniques for debt management are inadequate to effect the desired end. Evidence of this deficiency is provided dramatically by the stock market, which keeps on soaring and absorbing more and more liquid capital and distorting our entire economic development. Yet the Federal Reserve

Board is helpless to intercede. Being of orthodox bent, it is even restrained in proposing more extensive controls over the credit and investment policies of institutions outside the commercial banking field. If monetary and debt-management policies are to be effective in stabilizing prices, the Board must have, and exercise, powers over consumer credits, the nature of bank portfolios, and margin requirements in all security markets, as well as the operations of other banking and nonbanking financial institutions. Indirect economic controls can be effective only if they reach all credit and monetary institutions and channels.

On some occasions, such as in 1956 and 1957, it is more desirable to repress a boom with direct controls over a key material. I proposed to the Federal Reserve Board in the above period that it ask for the authority to allocate steel for civilian purposes as was being done for military purposes. Such a program would contain the inflationary pressures, spread out the demand, and hold the price level in check. It might have helped us avoid the recession. But the financial authorities and the conservative economic groups preferred to suffer inflationary pressures rather than approve direct controls.

Such policies need to be complemented with programs providing easy credit terms to economic sectors which should be stimulated even in periods of over-all tight credit. The American economy has successfully invented a federal program of low interest for farmers, housing, local authorities, roads, and other purposes. In periods of repressive monetary policies the underdeveloped, distressed, and weak sectors might still be aided in their growth and survival. It is appropriate for the Federal Reserve Board to be provided with these instruments of effective operation for controlling our supply of money and credit.

Administered Price and Service Sectors Key to Price Stability

But monetary policy and debt management are not sufficient to seal up the pressures of inflation. They cannot deal with the inflationary character of the administered price policies followed by business corporations. These programs are designed to yield both high profits and high prices. The recent Brookings Institution report and the detailed investigations of the automobile and steel industries by the Kefauver Senate Subcommittee on Antitrust and Monopoly establish that these corporations seek to safeguard their high returns through a price structure which disregards the opportunities for

broadening the markets through lower prices. No program for stable prices can be effective until the economic force of these corporations and their policies are subjected to close public scrutiny looking to the day when they will moderate their profit goals.

It would appear to most citizens that a pricing program which allows break-even points to be set at less than 35 per cent of capacity and seeks to assure a 20 per cent return on investment before taxes at 80 per cent of capacity is not in the public interest. Similarly, we seriously doubt that the American people would approve progressively lower break-even points in the determination of prices. Yet these are common practices in American industry. We have seen in the steel industry that the break-even point for profits has dropped from 50 per cent to less than 35 per cent of full capacity operation.

The impact of these administered prices of the large oligopolistic industries is reflected in the fact that wholesale prices in the durable-goods manufacturing industries rose 53 per cent from 1947 to 1957 at a time when unit labor costs increased by 15 per cent. In the same period, in the competitive nondurable-goods industries, unit labor costs rose by 11 per cent and wholesale prices by 10 per cent.

If we are to moderate our rising price level, it is essential that we reduce the profit targets of our large corporations. It is similarly important that we find a way of restraining the rise in the cost of our services. They have risen at a much faster rate than other prices. In the period from June 1955 to June 1958, prices for services other than rent jumped by 10.7 per cent, as compared with an increase of 7.1 per cent for all commodities. Monetary policy is not likely to reach this area.

Effective deflation of the administered price formulas would reduce the costs of some commodities used in the services, such as automobiles, homes, and other items. But we cannot expect a lower level of wages for most service workers; they are now generally substandard. The fees and incomes for professional persons may perhaps be stabilized. Some profit margins may be cut. But the major opportunity for lower costs in the services, as in other areas, is through higher productivity. Yet there is no concerted effort in this direction in this country.

I have proposed that the federal government establish such a productivity agency for the service industries, just as we have organized a National Science Foundation for the promotion of basic research. We have given financial assistance to other nations to

establish such agencies for their economies. It appears only appropriate that we do likewise for our own country.

In answer to those who charge trade unions with being responsible for the inflationary pressure, I wish to say that they are looking in the wrong direction. Trade-union economic demands are inspired by the milieu in which they are formulated. They are derived from the environment in which the workers live. If management is amassing great profits through exorbitant prices and the cost of living is rising, if the economy is expanding impressively and conspicuous private expenditures are evidence of advance, workers will make appropriate demands. The primary way to moderation is to puncture the inflationary psychology prevailing in business circles. They set the pace. Until such a state is realized, moderation in the workers' demands is hard to enforce.

Moreover, restraint upon workers will not change the price policies of big business. It is more likely to produce a feeling of discrimination which may ultimately be more costly to the economic system than the present arrangement. Evidence of the degree to which trade unions and workers are controlled by the environment in which they work and by the policies pursued in industry is furnished by the wage movements in highly competitive industries. Here wages have not risen in line with the trends in the monopolistic ones. Many workers have been forced to forego increases and have been unable to maintain even their real purchasing power.

A realistic program for achieving price stability would start with moderating profit goals set by big business and stimulating productivity advances in the services. Inflationary pressures derived from governmental deficit spending must ultimately be dealt with through countercyclical tax policies which will recoup the excesses of spending through levies on the higher profit margins prevailing in boom periods.

The National Minimum and a Better Market System

Two other problems confront us in our efforts to shape our economy into a better instrument of public purpose. The first is the assurance of a basic economic minimum for all. The present wage and price system does not assure such equitable distribution of the product. Western civilization has not tolerated, and cannot long tolerate, indifference to the individual's plight. Its sense of justice and its emphasis on equality of opportunity demand that all people enjoy

a basic minimum of necessities and services. We have developed a whole series of laws and practices designed to guarantee these to everyone.

We now have statutes which prescribe minimum wages and maximum hours. Social legislation provides assistance to the needy, benefits to the unemployed, and OASI benefits to the aged and their dependents and survivors; and disability insurance is now being granted in four states. Public housing brings decent shelter to the low-income groups in the United States, though in far too small numbers to have made a significant change in the American scene. Improved school systems offer free education through the secondary schools. State universities and scholarships have opened opportunities for advanced education. Developments in these provisions have not been completed. The full goal of the national minimum for all is still far from being realized. And most important, the nation has concluded that the attainment of these objectives is not merely an act of justice but also a step toward greater national economic wealth.

The second problem is to make the price system a more effective instrument for directing our resources and allocating our product. Two main innovations in our private economy have advanced this goal. Weak bargaining units such as farmers, workers, and small businesses have organized into groups, thereby improving their bargaining power and assuring prices more representative of their contributions to production. Equally important is the trend toward shifting more of the personal and social costs of production back to the price system. Through collective bargaining, the costs of sickness, unemployment, retirement, medical care, holidays, and vacations are becoming normal charges to be included in prices. Through taxes, some of these items are similarly added to our prices. Legislation is also making industry pay for the prevention of pollution and the safeguarding of forests, mineral resources, and other natural riches. The consequence is a price system which performs its functions more adequately. But it should be made even more effective by shifting more social costs onto private prices.

Economic Growth Through Redevelopment

The elimination of waste, moderation of the pressure for rising prices, improvement in the operation of our price system, and the guarantee of a national economic minimum standard to all Americans depend upon continued economic growth. The promotion of such

higher productivity has become vitally important for a progressive economy able to finance advances. The bold challenge from the Soviet bloc for a race in the rate of growth makes it even more urgent to find new keys to greater growth, for achievements in this area will become symbols of over-all victory and the door to greater benefits.

In the past, our culture relied on territorial expansion and increased efficiency for higher productivity. The former course has been closed with the end of the era of colonialism and imperialism, and with the closing of our own frontier. This country has been making marked strides in raising labor productivity since 1920. We have observed a higher output per unit of capital. More economic use of material resources and more efficient utilization of materials and space are also widespread.

Technology is having an increasing impact in recent years. It is introducing revolutionary changes in materials, processes, and products. From it are flowing new managerial approaches which are substituting integrated operations for specialized functional procedures. Automation is mechanizing many hand operations and replacing human senses with a synthetic brain. Research has become an organized vehicle for new economic growth.

The new era of technology is also bringing us closer to our partners in the non-Communist alliance. Both private corporations and the government are now formally letting contracts for research projects to peoples in other countries. We are also financing investigations of new technologies suitable to foreign climates and countries, hoping thereby to accelerate their economic growth and ultimately to benefit from these developments ourselves, as witness the work in the fields of solar energy and marine biology.

Another approach to growth has recently appeared as our nation has learned that the costs of renewing the vitality of declining industries, localities, and regions are smaller than those of starting up new ones. We are now examining older industries, using the resources of the technician, the economist, the sociologist, and other specialists to induce renewed growth in moribund and dying industries. The most outstanding illustration of this achievement is to be found in the paper industry. Similar proposals are now being advanced for the textile industry.

A new emphasis on redevelopment is being directed at geographical areas. Urban renewal has become an established technique for changing the physical appearance of communities. In New England

the most advertised effort in this direction has been made in New Haven. A redevelopment program has been started in Boston.

Finally, it is now being proposed that redevelopment techniques be applied to distressed labor markets and regions. In the second session of the Eighty-fifth Congress a bill designed to provide federal sponsorship for this effort passed both Houses of Congress but was vetoed by the President. A similar effort is being made in this session of Congress. The concept underlying this program is that distressed areas have to be redesigned. New locational advantages have to be substituted for the older ones on which were established prosperous economic complexes. Distressed textile localities can be rebuilt into thriving economic communities if the old sore spots such as poor housing, inadequate community facilities, insufficient education, repressed initiative, and low wages are eliminated and new facilities and advantages are created. In this age, when economic expansion is taking place in the service industries, communities must possess or create the essentials for attracting or generating such activities. Careful economic research and planning are becoming useful tools for blueprinting the major lines of redevelopment. The mere addition of new physical industrial structures will not create an adequate economic base. A full, rounded program of redevelopment is a prerequisite to a self-developing economic area.

A More Responsive and Democratic Business Structure

An effective economy, like a nation, must have a responsive and adequate governmental structure. The structure must be designed to provide adequate channels for bringing together the views of its citizens and for reaching the decisions most consistent with the interests of the nation. The older views of an adequate economic structure were built upon a vision of our society which no longer pertains. Our economy is dominated by large corporations in which the public has invested its funds. These are no longer private institutions. Almost thirty years ago, the separation between control and ownership began to be noted. Now a further cleavage is observable between control and management. The latter has become an elusive professional business elite which is not fully responsible to other groups. Controls are tenuous and remote. Even the financial community does little reviewing of the performance of large companies. They make so much profit that they are no longer dependent upon it for funds.

Many persons are looking for a new structure for American business to make it more responsive and responsible. Experiments in this direction have been too tentative and modest. The proposals for change have been too narrow to cause much excitement. There have been suggestions for representatives of the public, the consumer, and labor on the boards and for professional codes of behavior. These are only the first harbingers rather than markers of the new direction. More imaginative prescriptions are required to fill the needs of our nation.

Trade unions have created a new force within the industrial system. Management unwillingly has had to accept the fact that this power center exists and that its voice on behalf of production workers must be recognized. Collective bargaining agreements reflect this partnership of power. However, business has not embraced unionism or collective bargaining as part of the management process. Nor has the principle of collective bargaining as yet spread to all rungs of the employment ladder. The process of joint negotiation and consultation is most restricted. The pressure for its extension is inherent in our society, and it will in time transform this entire relationship.

Finally, our concepts of the American economy are based upon notions of decentralized, discrete, and small units in limited industries. They provide no place for employee organizations or groups representing other interests. The trade association, the industrial research agency, the national consulting technician, the corporation lawyer serving many clients, the national advertising agency catering to many companies, find no place in this theoretical structure.

Competition has been the major force in the past for effecting the balance of power and stimulating advance. Now we are substituting new determinants of economic behavior. Price leaders, pattern-setters, fashion-makers, new technologies and intellectual tools, and collective effort and organization are vital forces for achieving equilibrium and realizing growth. But we are unprepared to deal with these new forces.

We have encouraged economic haggling and new conflict, but we have protested the costs and results of major battles of interests. The old image of our economic society is obsolete, but we have not shaped a new one.

These vast changes have not aroused sufficient thought or impelled enough new ideas of how our society can be most effectively organized. The older notions of economic anarchy no longer befit our ways.

New forms of coordination are greatly needed. The invisible hand of the market no longer suffices. There must be more deliberate cooperation. To evoke more responsible behavior among all the economic interests, each must know more clearly what the public expects of it. There must be more informal meetings of the mind on national objectives and specific economic policies. A consensus of opinion among leaders of conflicting interests could make for the smoother operation of our society. We already have models for such procedures in the operation of organizations like the National Planning Association. How do we advance their activity and their acceptance in our society? How do we make them more representative? How do we assure adequate consideration for the public interest? If coordination results in a consensus, how do we implement the conclusions of these organizations?

Internal Obligations

The problems besetting us on the domestic scene in our efforts to realize the long-term goals of a democratic society are modest in comparison to the challenge confronting us at the international level. This nation is a member and leader of the international non-Communist bloc. We share the responsibility of helping in its economic development as well as in its military defense. We must promote democratic processes and humanistic goals both at home and abroad.

In providing this assistance we cannot violate the principles of democratic procedure. There cannot be dictation by us. At best, we can look forward only to the voluntary coordination of objectives and programs. Direction can be jointly defined. It requires constant discussion and mutual exchange of views and pressures to reach a consensus on strategy, and then tactics. We have hardly developed the agencies for such exchange, though they are highly necessary to facilitate understanding and crystallize a common view. It is only through a meeting of the minds that the parties will turn to agreements and then to procedures for implementation and formal plans for cooperation. Our nation has taken too few steps in promoting the structure for cooperative action in a democratic world.

In the economic field, we cannot let nations of the non-Communist world flounder. Many have set for themselves ambitious programs for economic development. They have attempted to accelerate their industrial development in the few key industries at a time when their

capital has been short, their experience limited, and their standard of living low. But their peoples continue to demand higher standards of living.

We have tried to interest other nations in accenting local commune development, beginning at the level of agricultural and handicraft production. Even when they follow this lead, we must recognize that they also are in great need of capital for basic public works. This financing must be furnished from international sources. The people are anxious to raise their standard of living and are impatient with the slowness of the results. Enough must be achieved to give them confidence in the newer democratic processes.

The achievement of these ends is partially our responsibility. We must help even while conditions are not favorable, while commitments are not certain, and while programs are conflicting and often impossible to achieve. We have to underwrite much of the development of other nations to prevent their impatience from undoing their faith and driving them to other camps. Our contributions will help them maintain their alliances with the Free World.

One warning must be sounded if we are to succeed. We must not seek to impose our economic system upon others. Particularly, we should not insist upon a theory of our economic system from which we have long departed. We have a mixed economy interlaced with many forms of governmental support, controls, incentives, and operations. If we insist that it is a system of free enterprise, we should at least make it clear to ourselves and other peoples that it is not the system prescribed by Adam Smith or John Stuart Mill. We have done ourselves and our partners much harm by demanding acceptance of an economic organization we do not have, and by branding other systems as "socialism" when they are not, in fact, socialistic.

As the richest country in the non-Communist world, dedicated to the maintenance of a decentralized democratic society which places the highest emphasis on humanistic values, we must help others in their struggles to raise their living standards, maintain political stability, and realize the goals of a democratic society – even if this assistance demands that we make considerable sacrifices.

REPUTATIONS

THIS new Department of *Dædalus* will publish reviews. But instead of adding to the flood of readily available comments on current works, "Reputations" will concern itself with seminal books and issues that have stood the test of time, and that now indeed deserve to be *re*viewed.

No more auspicious launching could be wished than that provided by the reviews below. The persistent freshness of impact of P. W. Bridgman's *The Logic of Modern Physics* (New York, The Macmillan Company, 1928) and Lewis Mumford's *Technics and Civilization* (New York, Harcourt, Brace & Co., 1934) makes one realize with something of a shock that these books appeared nearly a generation ago.

In each case the author consented to review his own book, although quite independently each warned that he might prove to be its severest critic. Nobody, of course, can know a book as its author does, but to write a balanced self-appraisal for public print is not an easy achievement. We acknowledge our thanks to both men for contributions whose value is not restricted to present readers.

I

P. W. Bridgman's "The Logic of Modern Physics" After Thirty Years

P. W. BRIDGMAN

THIS APPRAISAL of *The Logic of Modern Physics*[1] is written at the suggestion and invitation of the Editor, to whom I am most grateful for the implication that my *Logic* is worth so much attention.

In commenting on the book it is important to keep in mind the conditions under which it was written and the resultant limitations. It was written under the definite time restriction of a sabbatical half-year. My prior commitment was to my experimental work in the laboratory, which I expected to resume with no opportunity for further work on the book. In the limited time, I had to obtain as satisfactory answers as I could to those questions in physics which were giving me the greatest intellectual disquietude. The book was

essentially written for myself, and it was my own disquietude that was the primary motive. In lecturing on electrodynamics and thermodynamics, I had encountered many situations in which it seemed to me that the fundamental understanding of even the acknowledged leaders in physics was inadequate, to say the least. I had already come to grips with one comparatively minor detailed situation, that presented by dimensional analysis. Here, the bulk of professional writing on the subject afforded what seemed to me a pretty sorry exhibition of "metaphysics" in its bad sense. I had been able to think the situation through, separate the wheat from the chaff, and rid the whole dimensional situation of its metaphysics.

From this distance, I suspect that in writing the *Logic* I was really trying to do the same thing for the rest of physics. Of course, in the time available this was an impossible task, and I could only select what were for me the most pressing issues. If I were to rewrite the book today, with the same limitations of time and space, my choice of topics might well be different, or at any rate the emphasis would be different. Not only would the emphasis be different because of the intervening accumulation of experimental knowledge, but also because my own attitude has been altered in a number of respects as a result of continued reflection.

It would be expected on rewriting that the most radical changes would be with respect to quantum phenomena, since the book was written coincidentally with the appearance of Schrödinger's wave equation. The changes are nevertheless not as great as I might have feared. The most important is a change of attitude toward causality and determinism as necessary ingredients in any ultimately satisfactory account we give of the world. This I said on page 117: "We cannot permanently be satisfied with a picture of radioactive phenomena which represents radioactive disintegration as a matter of chance." I suppose I said this because I thought that the requirement for determinism and causality, perhaps in the guise of a principle of sufficient reason, was an inescapable requirement of any thought that could be called rational. In this I was in good company, for I suspect that such an opinion is back of the intransigent refusal of Einstein and others to accept "chance" as in any sense an ultimate component of the world. The reason I have changed is that I have seen it demonstrated that it is not an inescapable requirement of our thought; I have seen others learn, and I have myself learned, how to think without this requirement. It seems to me that the official

"Copenhagen" interpretation of quantum theory offers a way of thinking which is entirely possible and which contains, as far as can be seen at present, no concealed contradictions. The matter has to be settled on an experimental basis, and the decisive experiment has not yet been performed. Until it has, the attitude that there may be concealed causal details not yet discovered may perhaps remain heuristically useful, since it may provide a more potent stimulus to the search for new experimental effects.

Perhaps the respect in which my attitude has changed most drastically is suggested by the second paragraph in the first chapter, which I quote in its entirety.

> Looking now to the future, our ideas of what external nature is will always be subject to change as we gain new experimental knowledge, but there is part of our attitude to nature which should not be subject to future change, namely that part which rests on the permanent basis of the character of our minds. It is precisely here, in an improved understanding of our mental relations to nature, that the permanent contribution of relativity is to be found. We should now make it our business to understand so thoroughly the character of our permanent relations to nature that another change in our attitude, such as that due to Einstein, shall be forever impossible. It was perhaps excusable that a revolution in our mental attitude should occur once, because after all physics is a young science, and physicists have been very busy, but it would certainly be a reproach if such a revolution should ever prove necessary again.

To me now it seems incomprehensible that I should ever have thought it within my powers, or within the powers of the human race for that matter, to analyze so thoroughly the functioning of our thinking apparatus that I could confidently expect to exhaust the subject and eliminate the possibility of a bright new idea against which I would be defenseless. Of course, my point of view did have the justification that the fundamental physical material is with us now, being contained within our skulls, and is not subject to the sort of expansion that has occurred, for example, in the stellar universe, as modified in the light of information obtained with larger and larger telescopes or by radio-astronomy.* Nevertheless our

* In this connection it is interesting to notice how empirical knowledge of the cosmos has advanced in the last thirty years. On page 182 I spoke of the current estimates of the diameter of the universe as something of the order of 10^5 light years. Astronomers now sometimes talk of 10^{10} years in the same connection, an expansion by a factor of 100,000.

skulls contain a simply appalling amount of undiscovered structure which must condition and limit our thinking. For the foreseeable future the discovery of this structure and its manner of functioning offers a program practically as limitless as the program of the astronomer or the program of the physicist in finding what is inside his so-called ultimate particles. In fact, it seems to me that for us here and now the problem of adequately understanding the nature of our minds and what we can do with them is a problem more pressing, and perhaps more difficult, than the problem of understanding the physical world.

In attacking the problem of the nature of our minds no method of attack is to be summarily discarded. The comparatively new methods of the brain physiologist and the behavioral psychologist are without doubt of the greatest value and should be pushed as aggressively as possible. But the older methods, methods of "introspection," if you like, are not to be discarded. I believe that any of us, by as painstaking an analysis as possible of what he can see without apparatus in his own mental functioning, will discover many things which he had not previously noticed, or at any rate appreciated, and even things which have never been said before by anyone. We do not realize the extent to which we are confined in the verbal rut of the language bequeathed to us by society. Some of the considerations suggested by my changed attitude toward the problem of understanding the nature of our thinking provide part of the material for my new book, *The Way Things Are*.[2]

As far as I can judge, the most important aspect of any impact which the *Logic* may have had was in the attention it directed to the value of an "operational" analysis of our concepts and procedures. The matter has been the subject of considerable subsequent discussion, some of which has been under a misapprehension of what I was trying to say. This discussion, as well as the topics I recognized as inadequately treated when I wrote the book, has stimulated further reflection on my part on the whole subject; the results of these reflections have been described in many of my later writings. It is not possible to attempt even to summarize these here. In very broad outline I have not changed my fundamental point of view concerning the value of "operational" analyses, and any apparent changes are mostly by way of amplification or alteration of emphasis. If I were writing the *Logic* today I would change the emphasis so as to try to avoid what I regard as the one most serious misunderstanding.

That is, I would emphasize more that the operations in terms of which a physical concept receives its meaning need not be, and as a matter of fact are not, exclusively the physical operations of the laboratory. The mistaken idea that the operations have to be physical or instrumental, combined with the dictum on page 5, "The concept is synonymous with the corresponding set of operations," has in some cases led to disastrous misunderstanding. If I were writing again I would try to emphasize more the importance of the mental or "paper-and-pencil" operations. Among the very most important of the "mental" operations are the verbal operations. These play a much greater role than I realized at the time, and I have tried to emphasize this in my later writings, particularly in *The Way Things Are*. However, the fact that I appreciate the importance of the verbal operations does not mean that I now ascribe the exclusive significance to a linguistic sentential analysis that many of the logical positivists do, as exemplified for example by Carnap. It has always seemed to me that linguistic analysis of this sort is capable of giving only a partial and distorted picture of the whole situation.

If I were writing again, I would emphasize more that operational analysis is an analysis into doings or happenings, in contrast to the more usual analysis into objects or static situations; that the operational analyis is frequently if not always more fruitful than the more usual analysis; that the two sorts of analysis cannot be sharply separated from each other; that there is nothing absolute or final about an operational analysis; and that it is an analysis which involves no commitments on the part of the analyst, but that anyone can make an analysis in operational terms of his behavior in any situation whatever. Furthermore, although an operational analysis can by no means provide a complete account, it is a necessary form of analysis in that our understanding or command of a situation is not complete unless we can at least analyze it in operational terms. All, or most of this, was, I think, contained by implication in the *Logic*, but an alteration of emphasis would be required to bring it out. It is to be remembered that the most important applications of operational analysis in the *Logic* were to situations in physics, and these analyses I believe still stand essentially as they were given.

One aspect of the change of emphasis has to do with the question of "meaning." "Meaning" as I used it was tied up with operational analysis. My position was that, if a term could not be accounted for in terms of the operations contained in the particular universe

of operations accepted for the purposes in hand, such a term was to be adjudged "meaningless." This position is still tenable, but it may lead to misunderstanding in a wider context, because in everyday usage "meaning" has much wider connotations. For some sort of "meaning" can be ascribed to any expression whatever, and in fact it is always possible to give an operational analysis of any such meaning, provided only that the accepted operations are selected from a sufficiently extensive repertory. I still think it is profitable to talk of "meaningless" expressions in the particular contexts of science or of other specialized disciplines, but I would try to emphasize more than I did that such "meaning" is used in a restricted sense.

What now about the many topics which had to be left inadequately treated, and the many places, some of which I explicitly mentioned, in which all the implications of the method of operational analysis had obviously not been worked out? Some of these gaps I have tried to close myself, as in my book, *The Nature of Thermodynamics*,[3] in my analysis of the operations of logic and mathematics in my *The Nature of Physical Theory*,[4] and in a number of more specialized topics which I have treated in *The Way Things Are*.

There is one position which I adopted in the *Logic* which I now regard as positively incorrect; this has to do with the localization of energy in space. My position in the *Logic* was that there is no operational method of localizing energy or its changes at definite points of space, but that all we can justifiably talk about is the energy changes associated with whole systems. In taking this position I was not adequately taking into account considerations which were later set forth in *The Nature of Thermodynamics*. The dE, dQ and dW of the first law of thermodynamics, as ordinarily written, are the increments of energy etc. for the entire system, and this was the basis of my argument. What I did not take into account is that the first law is to be taken to be applicable to every sub-system that can be carved out of any given system, whether or not the partition corresponds to anything physically possible or whether it is possible only in imagination as a "paper-and-pencil" operation. Complete satisfaction of this requirement demands not only that energy (or its changes) be fully localizable, but that the first and also the second law be written in the form of partial derivatives at every point of space in terms of fluxes of energy and entropy.

These fluxes were something new as the primary constituents of the first and second laws, and the two laws formulated in terms of

them present an unfamiliar appearance. Furthermore, a specification of these fluxes in operational terms shows that they do not have the status which would correspond to an underlying physical "reality," because of the way they transform with the motion of the observing system. The same is true of the associated "energy." Although this is uniquely localized in any given frame of reference, the localization changes when the frame is in motion in a way inconsistent with attributing to energy a "thing-like" nature. A conclusion from the new analysis in *The Nature of Thermodynamics* is that the complete energy concept has a larger "paper-and-pencil" component than is usually appreciated, and that the concept as ordinarily handled contains a larger component of "reification" than is justified. This conclusion could also be drawn from the analysis in the *Logic*.

There is another matter relating to energy with regard to which I have changed my position. On page 115 I quoted with approval the remark of Poincaré to the effect that we would always have conservation of energy, because if we discovered an apparent violation we would invent a new kind of potential energy to take care of the discrepancy. This is the "conventionalist" view of energy, and of other physical concepts also. I now believe that this is much too complacent an attitude to take, and that although there may be an element of convention in our invention of new forms of energy to cover new situations, this is by no means the whole story. There is something here over which we have no control, and we are really saying something when we assert that conservation continues to hold (if it does).

Suppose, for example, that we have just discovered magnetic phenomena, having previously been completely ignorant of them. We describe the new phenomena with the aid of magnetic forces, which are capable of doing work, so that there are manifestations of energy, including in particular potential energy associated with the magnetic field, which we so construct that the changes of potential energy shall give the forces exerted in the field. If this were all there were to it, the potential energy of the field would be an invention and the accompanying conservation of energy a convention. But this is not all there is to it, because the first law of thermodynamics now demands cross relations between phenomena which we did not know before and which did not demand the invention of magnetic energy. For instance, thermodynamics demands a relation between the effect of pressure on magnetic permeability and the change of

volume when a body is magnetized. This relation is in no way a convention, because it is a relation between things independently measurable, over which we have no control. Whether the relation is satisfied or not we can tell only by trial—if it is satisfied, there is conservation of energy; if not, not. Conservation is thus much more than a convention, and it enables us to make predictions in a much wider range of circumstances than those which compelled us to recognize the existence of new forms of energy. Although it *may be*, and probably as a matter of fact *is*, impossible to make a logically or philosophically satisfactory sharp separation of what we contribute in a given situation (i.e., the "conventional" factor) from the part contributed by the "external" world (and therefore the part corresponding to "reality"), nevertheless things do happen over which we have no control, and our experience is by no means exhaustible in terms of conventions.

An analysis which I have not yet carried out to the extent I would like is on the nature of radiation. I am still dissatisfied with our understanding of the fundamentals here, and I believe that there are still simple, new, and important things waiting to be said.

With regard to the reaction produced in other people by the book, I have been disappointed in so far as the discussion has so much been directed to general questions of method to the exclusion of detailed application in specific situations.

There is one specific suggestion which I still regard as fruitful and which I am sorry has not been taken up. This is the suggestion on page 182 that the apparent qualitative difference between special and general relativity, between translational and rotational motion, may not be a difference "in principle" at all, but may be an artifact of the enormous numerical discrepancy between experimentally attainable velocities of translation and rotation, when these velocities are measured in "cosmic" terms. A theory built on a mathematics capable of expressing this point of view would probably not look like any familiar theory—at any rate, the attitude of mind that would frame the postulates for such a theory is different from the attitude back of our present theories.

It seems to me that by far the widest field for an extension of the methods of operational analysis is presented by quantum phenomena. Every quantum physicist pays lip service to the necessity of eventually expressing all the phenomena and operations of microphysics in macroscopic terms. The fundamental reason for this necessity is

that we who do the experimenting and analyzing are ourselves macroscopic creatures. The problem is thus the problem of expressing the microscopic world in terms of what we do—that is, this is essentially a problem of operational analysis. The problem is difficult because it requires as articulate a separation as possible between the things we do and the things we say—between instrumental and verbal operations. Although the microscopic is ultimately expressible in terms of the macroscopic, this does not mean that the macroscopic language which is to express it is necessarily the macroscopic language of daily life or of present-day philosophy, a point which I have made in a recent review of Heisenberg's *Physics and Philosophy*.[5] It seems to me that the overwhelming presumption is that the macroscopic language of daily life is intrinsically incapable of meeting all the demands which we now have to make on it, and that one of our most pressing intellectual problems is to devise a more adequate macroscopic language.

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II

An Appraisal of Lewis Mumford's "Technics and Civilization" (1934)

LEWIS MUMFORD

WHEN the book *Technics and Civilization* appeared, just twenty-five years ago, it possessed a distinction that had nothing to do with its intrinsic merits: it stood alone in its field. Stuart Chase had published a modest book on *Men and Machines* dealing mainly with American examples; while Oswald Spengler's happy awareness of technics in *The Decline of the West* was vitiated, as Mumford pointed out in a bibliographic note, by his unreliable data and erratic generalizations. These faults were magnified rather than decreased by his *Man and Technics* (1932). So perhaps the only modern book that could be regarded as the precursor of Mumford's was Ulrich Wendt's *Die Technik als Kulturmacht* (1906).

Looking back a quarter of a century, one does not know which fact should cause most surprise, the failure of anyone else to make such an historical and critical study, or the hardihood of a single scholar in venturing into a field where so little preparatory work had been done. Fortunately for Mumford, he had gone to a technical and scientific high school where he had a first-hand experience with most of the elemental tools and machine processes; and as a young amateur radio experimenter, making his own instruments, writing little articles for *Modern Electrics,* he knew some of the passionate preoccupations of the inventor and the engineer. Even more fortunately, he had come under the influence of three teachers each deeply concerned with the cultural impact of technics: Patrick Geddes, Thorstein Veblen, and Edwin E. Slosson. The latter's course on "The Modern World" at Columbia was deeply influenced by Ostwald's *Die Energetische Grundlagen der Kulturwissenschaften,* but that work only confirmed the brilliant interpretation Geddes had made almost a generation earlier in a paper entitled "The Classification of Statistics."

The immediate prelude to *Technics and Civilization* was a sketchy

essay, called "The Drama of the Machines," which appeared in *Scribner's Magazine* in 1930. This had resulted in an invitation from R. M. MacIver to give a course on "The Machine Age in America" at Columbia; and in the development of that course the focus changed from America and the modern world to Western civilization and the technical changes that began in the twelfth century of our era. But it needed a trip to Europe in 1932, in particular to the Deutsches Museum in München, to open up a growing literature on the historical development and cultural transformations of technics, a literature as remarkable in Germany then as in France and Italy today. Once Mumford discovered these sources, he realized that the current interpretation of the industrial revolution of the eighteenth century was a British provincialism, for the changes that seemed then to spring forth so suddenly, in fact had been under way from the twelfth century on, and were part of a larger movement that had transformed Western culture.

As late as twenty-five years ago, this was a challenging if not an entirely original view; though economic historians had been discovering that the coal and iron industries had not suddenly sprung to life with the invention of the steam engine, the emphasis still lay on the contributions of Watt and Arkwright and their colleagues. This foreshortened historic perspective had become chronic ever since Arnold J. Toynbee had coined the term "the industrial revolution" to describe what had happened in the eighteenth century. As a result, the role of earlier technical innovations was not so much misinterpreted as blandly ignored.

Mumford's first purpose, announced early in the introduction, was to set modern technics in a larger historic framework and to correlate the changes that had been taking place in our physical environment with changes that were taking place in the mind. He rejected the notion of the economic determinists, Marxian or otherwise, that technics had undergone a development in isolation, influencing all other institutions, but uninfluenced by human desires and decisions other than those directly connected with invention and organization. "Technics and civilization as a whole," he noted, "are the result of human choices and aptitudes and strivings, often irrational when apparently most objective and scientific: but even when they are uncontrollable they are not external." Perhaps the full weight of this sentence would be lost to a young scholar today. But in 1934 the notion that man internalizes his external "world" and externalizes his

internal "world" was not yet a commonplace of anthropology, still less of economics and history—and perhaps even now it is not such a commonplace as it should be. In the same vein he continued: "To understand the machine is not merely a first step toward re-orienting our civilization: it is also a means toward understanding society and toward knowing ourselves." For these two sentences the somewhat turbid rhetoric of the introduction perhaps deserves to be forgiven.

The best way to gauge Mumford's achievement and to point out where *Technics and Civilization* fell short may be to recapitulate the argument *seriatim*. The first chapter treats of the cultural preparation for the machine, giving weight to the influence of monastic regularity on the development of the clock and on capitalism, as an institution that turned people to quantitative calculations, favorable to physical science as well as to commerce. In this Mumford saw the beginnings of a depersonalized, mechanical system, barren of human fantasies and feelings, widely open to every kind of regimentation. The chief oversight of this chapter was the failure to relate the advance of mechanical invention to the severe labor shortage that followed the Black Plague of the fourteenth century, an event that, after the first shock, likewise turned people toward concentration on immediate and tangible goods.

But a greater omission was Mumford's failure to follow through the implications of his original distinction between tools and utensils, machines and utilities. In general, historians of technics have overestimated the role of tools and machines, the dynamic, mobile, masculine components of technics, artificial extensions of arms, limbs, hands, teeth, fists. By the same token, they have overlooked the more passive, static, feminine aspects, so conspicuous in neolithic culture: the role of the container and the internal transformer, corresponding to the breast, stomach, womb, and circulatory system. Cellars, bins, cisterns, vats, vases, jugs, irrigation canals, reservoirs, barns, houses, granaries, libraries, cities—all these are containers and they perform essential functions of storing potential energy and furthering chemical, biological, and social reactions.

Most of the great technical achievements of early cultures occurred without any machines but the simplest: their great inventive resources came forth in the art of building containers. The fact that this insight was not followed further in *Technics and Civilization* shows that Mumford himself was not able to shake off the preoccupations of his period.

Chapter two, "The Agents of Mechanization," widened the historic perspective further, by summarizing the original sources of technology. Here Mumford used an ideal, non-historic scheme worked out by his master Patrick Geddes, correlating the primitive occupational types, the miner, hunter, woodman, herdsman, peasant, and fisherman, with their ideal location in the descending course of a river valley, from mountain top to sea. This presentation not merely throws some light upon occupational origins, but also upon the intermixtures and transferences that take place when these types meet and mingle in the city, and finally produce the specialized craftsmen, technicians, and engineers one finds there from the late neolithic period on. In contrast to the Victorian notion, held equally by Comte and Spencer, that the industrial arts tend to produce a peaceful economy, Mumford, following Sombart's clue, pointed out the active role of war in stimulating mechanical invention.

Unfortunately, Geddes' valley-section diagram, though a useful device, was governed by the nineteenth-century usage that gave priority to the external environment and to tangible, observable agents. Such a mode of explanation, attributing war and weaponry to a mere extension of hunting techniques obscured almost as much as it revealed. If Mumford were writing on this topic today, he would have not so much to recast what he had written, as to go into a whole aspect he had passed over: the religious origins of war itself; and that in turn would lead to an appraisal of the role of the cosmic religions in imposing a sense of regularity, fixed succession, inexorable order, favorable to every kind of regimentation. Without this theological background, it is doubtful if the Pyramids would have been built with such exquisite accuracy, or whether collective human machines could have been effectively organized and brought into play. Yet all this throws an important light upon the existence of complex machines in early cultures, whose significance Mumford did not grasp till twenty years later. By any of the standard definitions of the machine, such instruments were not lacking in the Bronze Age. What made them so long invisible was that their component parts, which formed the work-army or the Sumerian phalanx, were composed of perishable materials—human beings. The great achievement of modern technics was to transform blood and sinew into iron, steel, and Babbitt metal.

Apart from assembling old facts in new relationships, the main value of these early chapters was a shift in the whole point of view,

which made technics an integral part of higher civilization. This was quite different from the earlier evaluation that made man's development dependent almost solely on his being a "tool-using" animal—as if he could have transcended the limitations of his immediate environment without his greatest invention, language and formal symbolism.

With the next three chapters, dealing with successive phases of technical developments in and around 1000 A.D., we come to the most original and yet in some ways the most dubious part of the whole book. Following the lead of Geddes and anthropological precedent, Mumford defined the dawn age of modern technics, the eotechnic phase, as one based on wind and water power, with wood and glass as the favored materials. His sections on the role of wood and glass, along with the early one on the monastery and the clock, count as perhaps the most distinguished passages in the book. But beyond this Mumford had made another contribution, still largely neglected. He had defined the nature of a technical phase as consisting of a particular mode of power, particular modes of transportation and communication, and a particular set of metals and other material resources.

Mumford was not unaware even then of the difficulties of any scheme of periodization. He referred to these three phases as successive, but overlapping and interpenetrating; and he successfully resisted the temptation to treat them as definite periods in time. Though the conception of phase avoids this patent difficulty, it opens up other problems, almost as serious. If the neotechnic phase is that of the light metals, copper, aluminum, magnesium, where does our nuclear complex belong, with its dependence upon the rare heavy elements? And is there not a parallel between the breaking down and re-synthesis of coal tar products in the paleotechnic regime, and the breaking up of the atom and the synthesis of new molecules today? Is there not an even more uncomfortable resemblance between the wholesale but temporary pollution of atmosphere, water, and soil that went on in the iron and coal technology, and the more sinister permanent pollution threatened by nuclear technics?

If the division into phases becomes vexatious with the data immediately in hand, the whole scheme breaks down as soon as one steps outside the arbitrary thousand-year period and tries to work out a more universal succession of technological phases. J. Meursinge's grammatic scheme is the only one I know that has attempted to do this

in detail over the entire course of history, but it is quite as unsatisfactory in its definitions and delineations as the worst kind of empiricism. The author of *Technics and Civilization* may in fact congratulate himself over the fact that the division he used never effectively caught on; and it broke down in his own mind before it could do any serious damage.

Looking back over these historic chapters, one is conscious of much new material that might now be added, but little that should be taken away. Yet there is one lapse that the author should regard with shame, even though he sinned in good scientific company. Following Geddes, he anticipated and identified some of the elements in an emerging biotechnic economy, as in the invention of the telephone and the airplane, but he mentioned the possibilities of atomic energy (page 380) only to dismiss them. In a purely historic account, this oversight might have been pardonable. But the essence of Mumford's method, what in fact distinguishes it from more traditional procedures of scholarship, is that it embraces the potential and the possible, as a necessary part of any adequate description of a human institution.

Nor could Mumford plead ignorance of the approaching possibility of using this new form of energy for destruction, even more effectively than for work. Not merely had he read Frederick Soddy's *Matter and Energy* almost as soon as it came out, but he had also followed H. G. Wells' vivid and amazingly accurate description of an atomic war, in the novel *The World Set Free,* published serially in 1913. Furthermore, Mumford was a sufficiently close student of Henry Adams to know how deeply concerned that prescient historian had been to prepare his colleagues in science and scholarship to assume active intellectual guidance in the drastic – indeed catastrophic – social changes that atomic energy would bring about.

Unfortunately, a certain intellectual disdain for the crudity of Adams' attempt to equate social transformations with Willard Gibbs' Phase Rule led him to undervalue Adams' profound intuitions, which were the latter's total response to far more complex data, much of it still unsymbolized and unformulated, on which he had drawn. In failing to do justice to Adams' insight, Mumford did equal injustice to himself. What justified the generalist's existence, if not the power to see clearly possibilities that specialized competence rejected? His unwillingness to face the prospects of atomic power rested, it is true, on the sound notion, stated immediately after, that solar energy

would be entirely adequate to man's industrial needs once we had invented an efficient electric accumulator. But I suspect that his unwillingness to deal with the explosive possibilities of atomic energy was largely due to sheer cowardly apprehension. Wells had too graphically demonstrated the way in which this triumph would actually be perverted.

The second half of *Technics and Civilization* was an attempt to provide a fresh point of view, or, in broader terms, a philosophy capable of assimilating the goods of technics and coping with the evils that accidentally or integrally had accompanied Western civilization's growing absorption in the industrial process, treated almost as an end in itself, that is, as a religion, rather than as a means of satisfying human wants.

Chapter VI, "Compensations and Reversions," attempts a critical examination of the weaknesses of the so-called machine age, weaknesses that were all the more obvious during the 'thirties because the maldistribution of the products of the machine had brought the whole mechanism to a jarring standstill. Mumford attempted to show how the human deficiencies of this machine-dominated civilization had been historically overcome by various compensatory devices and shock-absorbers, from the romantic "return to nature" to a stultifying relapse into savagery and violence. Here Mumford was on a trail he would now be prepared to carry much farther back, into the very origins of civilization itself. At all events, the sections "Mass Sport" and "The Cult of Death," it seems to the reviewer, have lost nothing through the passage of time. Unfortunately, they now need an additional section, "The World as Extermination Camp," as the ultimate destination of unqualified power released from all organic disciplines and humane inhibitions. In re-thinking these passages recently, Mumford found that they failed to give sufficient weight either to the irrational compulsions and fixations that stepped up technological change, or to the irrational goals its most ardent disciples have taken for granted.

But the chapter that was perhaps the most ingratiating to Mumford's contemporaries in the 1930's was "The Assimilation of the Machine." This dealt with the various ways the machine had enriched, even while altering, the whole domain of esthetic and even ethical expression. Most of what Mumford said here has become a commonplace by now: who does not appreciate the esthetic values of the inorganic and the depersonalized, the abstract and the

mechanical, of simultaneous images and visual experiences below the surface of everyday events, as popularly revealed in the photograph, the stroboscopic image, and the motion picture? Mumford's first essay in this direction, *Machinery and the Modern Style* (1921), had in fact antedated Le Corbusier's vivid paeans; and he himself has recently amplified this chapter by his observations on mass production and reproduction in *Art and Technics*. But the point of view had long been developing, among the leaders of the Deutscher Werkbund in Germany and the Cubists in France.

Yet precisely because this chapter is superficially so up-to-date, it now wears a curiously old-fashioned air. It attributed to the machine itself positive qualities that were in fact due to human intentions—qualities that often disappeared (as the good lines of the motor car have so largely disappeared in America) at the very moment the technical processes themselves were being simplified and perfected. No one could write an honest chapter today without going far more exhaustively into the perversions that have crept into the whole process.

In the final chapter, "Orientation," the whole outlook and tone of the book, as well as the underlying philosophy, seem even more definitely dated. It is not so much in its philosophy as in its cheerful expectations and confident hopes that it now seems something of a museum piece: even in those plans that have been carried through, the realization has retrospectively disfigured the anticipation. Mumford assumed, quite mistakenly, that there was evidence for a weakening of faith in the religion of the machine, coupled with a shift in interest to the biological and human aspects of technics. This was an erroneous assumption; and by now most people have forgotten the grounds for it—that after four years of economic depression many Americans had so completely lost their faith in technology that they were prepared to settle for a subsistence economy. Mumford did not accept such defeatism: but he plainly did not anticipate that the American economy would be salvaged, in all its radical lopsidedness, by war and preparations for war, aided by a rising birthrate.

The crux of this final chapter is the section called "Basic Communism," in which Mumford wrestled with the problem of normalizing consumption in order to distribute the advantages of mass production without establishing a totalitarian dictatorship or a war economy, and without destroying surplus goods for the sake of maintaining a price level, as had been done in the early days of the New Deal.

In a few years, this argument would become suspect and, because of its accurate terminology, would be falsely identified with the very Marxian totalitarian assumptions it explicitly rejected. What was said under the rubric of "basic communism" might today be easily passed off without comment as "social security."

I have passed lightly over the major weaknesses of this book, with the charity an older man owes a younger rival. But I feel that the book is now seriously inadequate at both ends. The development of technics before 1000 A.D. would surely deserve at least as many chapters as were given to its advances since that time, though this might demand even greater gifts of condensation and generalization. By the same token, it would probably need more than a single new chapter to make even a brief summation of the advances of the last quarter century—and it is doubtful if we have enough perspective yet to evaluate them. This explains why Mumford has so easily resisted the very obvious duty of bringing the book up to date.

So much for what the book attempted, and where, palpably, it failed. But what *Technics and Civilization* said by its very being was probably more important than any special contribution: for what text and illustrations joined in saying was that technics was not merely the product of engineers, inventors, workmen, capitalists, scientists, but the expression of a whole society, to be enjoyed and assimilated, not alone because of its immense material productivity, but because of the values and forms and meanings it brought into existence—and still more for those it may still bring, once technics escapes the pressures toward regimentation and exploitation that have so long, from the days of the pyramid builders onward, undermined its human applications.

About those qualities that seem to me to constitute the peculiar strength of *Technics and Civilization,* I have said nothing—the interweaving of factual presentations and human evaluations, of causal and purposeful interpretation, the continuous penetration of the subject at many levels. In Mumford that silence would be due less to modesty than to a sense of failure, for the demonstration he gave has not greatly popularized the method behind it, nor has it lessened the academic suspicion that this very comprehensiveness betrays a certain want of rigor, of the kind familiar to specialized scholarship. But to the reviewer, absolved by his commitment from either disappointment or modesty, this failure suggests another interpretation. Whatever the original defects of *Technics and Civilization,* whatever

further shortcomings time has disclosed, it still unfortunately possesses its original distinction: it stands alone, an ironic monument if not an active influence.

WORK IN PROGRESS

The Ecology of Imagination in Childhood

EDITH COBB

THE PRESENT ESSAY is an abridgment of a longer work in process, which attempts the difficult task first of defining what we mean by the genius of childhood as a common human possession; and second of showing that a major clue to mental health lies in the spontaneously creative imagination of childhood both as a form of learning and as a function of the organizing powers of the nervous system. Of necessity, the exploration includes tracing the relationship of this early psychophysical force in human development to those uncommon forms of genius which constitute the high point of achievement in human growth potential, with roots, as I believe, in the child's perceptual relations with the natural world.

I propose to argue in this paper that children are born animals and mature biologically, but evolve culturally into human individuality, reaching widely different levels and norms. This use of the term "evolution" must be taken literally—that is, as a "true metaphor,"[1] a description of an experiential continuation of nature's own strivings toward a transcendence of biological levels through culturally elaborated relations with environment. The difference between animal and human nature would then be seen to consist of the uniqueness of every human individual as a species in himself, while nature's drive toward speciation and variation in forms could be interpreted as continuing in individual form into human life, first in the child's speculative play with nature's plasticity, and ultimately in man's individual striving to create forms *not* found in nature, in the arts, sciences, technology, and thought.

Historically speaking, individual genius has played the principal role in the achievement of a general cultural transcendence of previ-

ous levels, both psychological and cultural, by introducing higher forms of ability, purpose, and aim into the cultural continuum. The genius of childhood, in the sense of extreme personal originality and the creation of private worlds, is discontinuous and persists into adult life only as a specialized, highly cultivated condition. But the gift of our prolonged human childhood to the family of man is plasticity of response to environment. This plasticity of response and the child's primary aesthetic adaptation to environment may be extended through memory into a lifelong renewal of the early power to learn and to evolve.

If we examine the statements made by adult geniuses about their own childhood and compare them with references to the child in myth and religion (in particular in the Christian religion), it seems clear that there is and always has been a widespread intuitive understanding that certain aspects of childhood experience remain in memory as a psychophysical force, an élan, which produces the pressure to perceive creatively and inventively. For from this position, creative and constructive mental processes do not result from an accumulation of information, but from the maintaining of a continued plasticity of response of the whole organism to new information and in general to the outer world. Perhaps we have arrived at a new age in which this condition of mind and purpose can no longer be optional or left to the gifted few, but must be recognized as a common human need in adapting to life and society.

My position is based upon the fact that the study of the child in nature, culture, and society (the evolution of social attitudes toward childhood into present realization of its importance in everyone's life history) reveals that there is a special period, the little-understood, prepubertal, halcyon, middle age of childhood, approximately from five or six to eleven or twelve – between the strivings of animal infancy and the storms of adolescence–when the natural world is experienced in some highly evocative way, producing in the child a sense of some profound continuity with natural processes and presenting overt evidence of a biological basis of intuition.[2]

These concepts have evolved from four principal sources: first, biographical and autobiographical memories of gifted people; second, the Freudian concept of childhood as the core of human development, particularly as this is treated in social casework,[3] which furthers adaptation of the unique individual to his total environment; third, a study of the plastic, dynamic nature of imagery in contrast to the

more static condensed simultaneity of the symbol; last, and as a tool for the implementation of these sources, an investigation of studies of the changing imagery in the language of natural description, which disclosed this special trend in perception, a trend in the cultural evolution of attitudes toward nature which has produced the concept of ecology, the study of mutual relations, the give-and-take between organisms and their complete and total environment. The science of ecology provides us with a plastic image of behaving organisms in a behaving world, and a tool for synthesis as well as analysis of the system of meaning and verbal imagery which we use to describe nature.

In my collection[4] of some three hundred volumes of autobiographical recollections of their own childhood by creative thinkers from many cultures and eras, ranging from a fragment from the sixteenth century to the present, it is principally to this middle-age range in their early life that these writers say they return in memory in order to renew the power and impulse to create at its very source, a source which they describe as the experience of emerging not only into the light of consciousness but into a living sense of a dynamic relationship with the outer world. In these memories the child appears to experience both a sense of discontinuity, an awareness of his own unique separateness and identity, and also a continuity, a renewal of relationship with nature as process. This apprehension is certainly not intellectual; I believe it is rational at least in a limited sense, a preverbal experience of an "aesthetic logic" both in nature's formative processes and in the gestalt-making powers of the child's own developing nervous system, aesthetic powers that overlap meaningfully in these moments of form-creating expansion and self-consciousness.

"Form is the magic of the world," as Dalcq has expressed it, whether in nature, play, art, or thought. But it is the activity of creating form which has fascinated the mind of man, most particularly as the power to animate the inanimate, the ability to make things move in the shape of working models and refined machines, the power to produce animation even in the "still" image of the plastic arts. This shaping force, this desire to master and to create motion, not only is at the basis of all human technical invention but also is the prime characteristic of effective metaphor: "Those words set a thing before the eyes that show it in an active state," said Aristotle.

It is especially interesting to note, therefore, that in dictionary terms the word "animate" derives from a Latin word signifying "soul" or

"breath" (a metabolic action pattern), and that among its meanings are "to give spirit to" or "to put in motion or operation" or, synonymously, "to energize" (Webster). The term "genius" plays with all these threads of meaning, including mental power or energy, but in its earlier usage it referred most frequently to the spirit of place, the *genius loci,* which we can now interpret to refer to a living ecological relationship between an observer and an environment, a person and a place.

Instead of working backward from the adult's position to the child's, I found it necessary in my exploration of the genius of the living child to set up methods of investigating creative purpose in the child's play and art. The value of forms produced was secondary to the importance of the response to "aesthetic logic" in the child's gestalt-forming action patterns with the instrument of the self. Using various forms of so-called projective methods and play techniques (in particular, modified versions of the Lowenfeld World-Play Technique and the Thematic Apperception Test, accompanied by a continual reference to the Rorschach categories of Form, Color, Motion, Time and Space, Animal and Human Response), I became acutely aware that what a child wanted to do most of all was to make a world in which to find a place to discover a self. This ordering reverses the general position that self-exploration produces a knowledge of the world. Furthermore, while observing the passionate world-making behavior of the child when he is given plastic materials and working dimensions which are manageable and in proportion to his need, accompanied by a population of toys, fauna and flora, and artifacts that do duty as "figures of speech" in the rhetoric of play, I have been made keenly aware of those processes which the genius in particular in later life seeks to recall.

The tendency to play may be said to be characteristic of animals reared in a nidicolous (i. e., a specifically nestlike) domestic ecology. The important point about the child's play is that it includes the spontaneous effort to be something other than what he actually is, to "act out"* and to dramatize speculation, which is in effect to take play out into the four-dimensional continuum by adding motion and sequence, and therefore time, to its procedures.

As lay people, we probably think with greater ease about biological

* An important term, which now is unfortunately also the metaphor for delinquency and neurotic behavior.

evolution in terms of continuity; and, as Julian Huxley reports, "Life is and must be a continuum because of its basic process of self-reproduction: in the perspective of time all living matter is continuous because every fresh portion of it has been produced from pre-existing living matter."[5] However, he adds, "Discontinuities of various sorts have been introduced into the continuity," the study of which should be of great value, for they are of first-rate importance to a long-term view of evolution. "The chief of these discontinuities," Huxley continues, "are those of the cell, the multicellular individual, the species, and the ecological community" – that is, the "ecological niche," the preferred perceptual world in which the organism functions. Each one of these discontinuities is of major significance to the psychobiological nature of man's individual organism and to his psychosomatic personality. In nature, continuity of species is maintained by interbreeding; the discontinuities with previously related forms are maintained by absence of interbreeding brought about by isolating mechanisms, which in animal life also include psychological barriers to mating. Man must create his own psychological identity in order to survive, and he represents a climax in the historically related achievements in discontinuity. His psychosocial history shares in this process; one need only remember the discontinuous nature of such social mechanisms as monogamy, celibacy as a social ideal, or the role of the incest motif, found in one form or another throughout civilization.

When Freud defined childhood's middle age as the latency period, he referred only to latent sexual drives, which, according to psychoanalytic interpretation, become less purposive when the child's mastery of body and speech directs his energies toward other types of cognitive satisfaction. Energy remains libidinal, and creativity a substitute for sex. I suggest that this period is also a time of far more general latent awareness or "half-knowledge,"[6] a period of plasticity of perceptual response and "biological memory" which when employed in original gestalt-building processes must be described as intuition (in contrast to other instinctual biological drives).* In infancy the impulse to love is aroused to the level of passion and yet must remain unfulfilled and unformulated in any direct sense. The passion of infancy is therefore addressed to goals and pur-

* Intuition is not necessarily benign. It is relational and structural; its value depends upon the purposes to which it is addressed.

poses unknown but not entirely "unperceived," for in ordinary experience in early childhood, the parents (more specifically the nurturing figure of the mother) are the targets of love, a fact that evokes some latent foreknowledge of sexual form and function. The "distance" between the self and the objects of desire, and the natural pressure for fulfillment, are equally real, although "out of sight." The child fills in the distance between the self and the goals of desire with imagined forms. The basic evolutionary characteristics of perceptual processes, also latent in the human nervous system, become dominant as the child emerges more consciously into a perceptual participation in external nature. The reproductive urge is undoubtedly also represented in the desire "to body forth the forms of things unknown," but the biological urge toward growth becomes the psychophysical urge toward transcendence, the urge to create higher and ever more complex gestalten in perception and cultural meaning.

Freud has made plain to us that the problem of maintaining our individual transcendence of levels above our biological heritage of animal instinct and impulse is a matter of life-long effort. It begins with the cultural demand for the discontinuity of instinct, which he has described as the Oedipal situation, a climax in nature's use of isolating mechanisms in culturally elaborated form. While the child's expression of reproductive mechanisms is biologically delayed and culturally restricted, the psychological growth mechanisms have been culturally elaborated, speeded up, and highly differentiated. The child's will and need is to use energy for purposes of growth, thus following nature's own biological pattern of alternating the use of energy between self-reproduction and self-increase. Energy in itself cannot be described as "libidinal," although the body's purpose in the use of energy may be addressed to libidinal ends. It is the process we know as metabolism, which furnishes "the energy system which is the body" (to use Sir Charles Sherrington's phrase) with what D'Arcy Thompson has called "the power to do work."

In his study of prenatal and neonatal infancy,[7] Gesell finds that the development of genius is a true growth phenomenon, a continuation of the earliest prenatal morphological strivings. The embryology of mind, according to him, is to be sought in the embryology of behavior, even in the earliest postural mechanisms and the first prenatal adjustment to the ceaseless pull of gravity. Genius, he finds, is an achieved "personal possession," an extension of the body's own growing corpus of behavior into nature's continuum. We would say here

that genius is a personal achievement rather than a possession, a personal "reading" of nature extended into the semantic unknown. But, as Gesell states, the action patterns of growth are continuous and analogous; the unfolding experience becomes a part of all metaphor. We would extend this idea to stress the individual uniqueness of human psychological and cognitive growth, in spite of the fact that the recognition of growth or learning ultimately depends upon culturally standardized methods. The child's early perceptual continuity with nature, the innate gestalt-making powers of the nervous system, then remain the biological basis of intuition. The cognitive process which differentiates man from all other animals is the source of his predictive, prefigurative imagination, enabling him to learn and evolve culturally. As Norbert Wiener, whose genius has been directed to the understanding and "modeling" of the mind as mechanism, has remarked, "It remains a miracle that children do learn," that they do match perception and language so successfully. For every child this relational behavior is an act of genesis, the genesis of his real world as a personal yet culturally conditioned image.

Thorpe's recent summary of works on animal learning and perception[8] provides a significant re-enforcement of the present concept of a perceptual basis of human intuition and learning. Perception, he finds, must now be considered to be a primary drive in evolution, and the exploration of environment to be an innate appetite deriving from a principle of expectancy within the animal's neural tissue. However, the exploratory tendency in the animal, which Thorpe identifies as "latent learning," is not addressed to primary survival needs. For the animal as for man, the ultimate satisfaction of perceptual expectancy and perceptual exploration is the organization of the perceptual world into the "good gestalt," into environmental shapes that "hold," that are populated with forms and are rich in perceptual meaning. In bird, fish, beast, or man, the need to make a world is intricately related to the sense of identity. Perception even on lower levels of animal life is not a response to simple sense data, "but an active organizing process, itself possibly including an element of purpose, tending all the time to build up primary perceptions into more and more complete and unitary systems." Thorpe states that "purpose" here has the usual meaning, "a striving after a future goal retained as *some kind of image* or idea" [italics mine]. Plasticity of response is again the important feature in perception, for "in as far as the original faculty of perception retains or increases plasticity during evolutionary

development, it becomes the various learning processes that we know."

But most significant to our argument here is the idea that perception is a comparative activity which contains a neural experience of duration, and that "perception of a time dimension including an element of expectancy is as fundamental to organisms as is perception of space." Perception is a kind of temporal scanning, a translation of spatial into temporal patterns after the manner of scanning as performed by a television apparatus. Time and space dominate all perceptual activities. In this activity "perception of relations is primary while sensation is the result of secondary analysis." In human life the primary perceptual activity is not the photochemical synthesis of a prefabricated gestalt, but a creative imagination of form.

The child, like the poet, is his own instrument. His whole body, erotized and highly sensitized by the necessities of nurture and touch, is the tool of his mind, and serves with a passionate enjoyment in a creative engagement with the forces of nature. Examination of the psychobiography of genius suggests that the perception of wholeness has been a characteristic of all individuals who have thought more closely with the instrument of the body. Perceptual unity with nature is, of course, not a new concept.* As Conrad Aiken has expressed it, drawing upon the philosophy of ancient China:

> The landscape and the language are the same
> For we ourselves are landscape and are land.[9]

Taken together, the child's intuitive sense of a perceptual continuity with nature and the often expressed hope that the poetic and the scientific aspects of our culture may be evolving toward a new synthesis with nature suggest that the "unmediated vision" of childhood is the primary evidence, perhaps the source, of the predictive, prefigurative imagination of man, and that the exercise of this imagination is dependent upon autobiographical recall in some form. Geoffrey H. Hartman, pursuing this thought in his analysis of the work of four poets,[10] points out that Wordsworth was not only the first English poet to treat autobiography poetically, but also the first to separate personal experience from the impersonal element within

* The false metaphors of "contest" and "conquest" of nature continue to interrupt our perceptions of nature's aesthetics.

autobiographical recollection in order to obtain a vision of the basic creative process, "the motion that impels and rolls through all things" in the order of nature, using himself as a recording instrument. Perhaps it is significant that this was the point in recent social history at which the social reality of the concept of individual uniqueness was beginning to assert itself, coinciding with the emergence of the autobiographical impulse (until then something of a rarity in printed discussion) as a form of the "education of the poetic spirit" (Hourd's phrase[11]), with roots in the perceptions of childhood.

In an important study, John Oman[12] comments that in every genius whose special gift is perception, either time or space seems to be a dominant intuition in childhood. We would say here that genius consists in the continuing ability to recall and to utilize the child's primary perceptual intuition of time and space. Oman recalls that his own exodus, his first sense of discontinuity and aloneness with respect to other individuals but equally one of continuity with nature, occurred when as a child of six he stood at the edge of the sea on a Sunday morning in summer. His own awakening to a sense of nature as infinity and yet as a part of himself seems to have occurred quite directly in relation to the earlier experience of a Sunday morning in church. This was not a specifically religious experience, but simply a response to an open-system attitude, a state of temporal and spatial inquiry – Where am I? Who am I? – an attitude toward nature which is frequently evoked within or as a result of religiously conditioned circumstances described in childhood recollection.

In a charming autobiographical account of the birth of his own genius,[13] Giordano Bruno recounts his "acting out" of this particular version of childhood experience, the intuition that drove him to continue to relate "depth of potentiality to the sublimity of action" and held him in a state of enchantment even to his death at the stake. In Bruno's allegory the sense of a deceptiveness of appearances across time and space is described as a colloquy between two mountains, his "parents" in nature – Mount Cicada on whose slopes he lived, and Mount Vesuvius opposite. To satisfy himself he journeyed on foot across the distance between Cicada and Vesuvius, to find each of them barren at a distance, but rich in texture close by. "Thus did his parents [the two mountains] first teach the lad to doubt, and revealed to him how distance changes the face of things." In later life, Bruno averred, "No matter in what region of the globe I may be, I shall realize that both time and space are distant from me."

It is significant that adult memories of childhood, even when nostalgic and romantic, seldom suggest the need to be a child but refer to a deep desire to renew the ability to perceive as a child and to participate with the whole bodily self in the forms, colors, and motions, the sights and sounds of the external world of nature and artifact. The nonanthropomorphic position, the ability to see and think in terms of process as well as in terms of myth and allegory or personal drama, is the basis for separating process in nature from psychological motivation. This, the gift of the ancient Greeks to the world, is assumed to be open only to intellectual understanding. While the Greek discovery represents a great step forward in intellectual and cultural evolution, the basic neural potential for performing this distinction and differentiation is, I suggest, a functional part of childhood everywhere. The experiences remain largely nonverbal – although not entirely so, if we take into consideration some of the astonishing and beautiful cosmic questions of the child. But such experience is subject to recall in remarkably similar terms by gifted or creative people from the most widely differing eras and backgrounds –social, cultural, and geographical.

In his autobiography,[14] Bernard Berenson gives an exceptionally full and rich description of his discovery in early childhood of the sense of "Itness" as an integration with the ongoing process in nature. The position achieved by the child in this experience of "psychological equipoise" became a stabilizing influence, a life-long goal, and also the basis of a highly skillful method of observing and learning. His experiences continued through childhood and boyhood. In particular, one balmy summer morning he "climbed up a tree stump and felt suddenly immersed in Itness.* I did not call it by that name, I had no need for words. It and I were one." Of these moments of exodus into the temporal and spatial continuum, Berenson says that "in consciousness this was due not to me, but to the not-me, of which I was scarcely more than the subject in the grammatical sense." As an adult he sees himself "as an energy of a given force in radiation and of a certain power of resistance," but adds that "he seems to be the same in these respects as I remember being at the end of my sixth year," when he became latently aware that the form-creating harmony of his perceiving body and the form-creating harmony of nature were one and the

* It may be remembered that Rilke as an adult at Duino underwent a similar experience in a tree cleft.

same process, the process which eventually enabled him to perceive and to estimate value in art as the appearance of living motion in his perceptual "readings," even of a stone fresco. The experience at the dawn of conscious life remained the "guardian angel," returning in memory to remind him that "It was my goal, It was my real happiness," the happiness of perceptual creation upon which all other creativity depends.

Further examples are to be encountered in autobiographical recollections from Africa, Asia, Europe (North and South), and the Americas. These descriptions – some fleeting, some lengthy – of the inception of a relationship with nature express not only a deep need to make a world the way the world was made, but also the need to make a piece of the real world in which one lives with others. This is, I suggest, the only truly effective counteragent to the forces of internal conflict which until recently were considered the major subjects of study, the main background to purpose in life. Once the theme of world-making is seen as a basic human goal, the emphasis upon discontinuity and the pressure toward self-knowledge represented by the Socratic axiom "Know thyself," so essential to the differentiation of the idea of man into the image of the unique self, seems to diminish in value, or to have reached a saturation point as a useful psychosocial concept. This is not to say that the concept of the individual or of individuality is outmoded or even fully realized in social aims, but that, as a tool for the shaping of thought about human behavior, self-exploration as an aim in itself is not merely less and less effective but is unconsciously supporting a dangerous trend toward neurotic self-interest on a world-wide scale.

This point of view calls for a redefinition of human individuality, not only in terms of human relations, but also in terms of man's total relations with "outerness," with nature itself. Such a redefinition seems feasible in terms of the developing intellectual climate. The pattern of cultural evolution that has been long in the making is one in which the concept of ecology, the study of the relations between organisms and their total environment, will play a major part.

REFERENCES

1. "What is true metaphor?" Owen Barfield inquires (*Poetic Diction: A Study in Meaning* [London, Faber and Faber, 1952], p. 86); and in replying to his own question, he refers to Bacon's statement in *The Advancement of Learn-*

ing: "Neither are these only similitudes, as men of narrow observation may conceive them to be, but the same footsteps of nature treading or printing upon several subjects or matters." Barfield's conclusions are quoted here as typical of a kind of thinking that is central to my thesis, for this treatment of perception and the making of meaning leads to the observation that it is these very footsteps of nature "whose noise we hear alike in primitive language and in the finest metaphors of poets."

2. I am here following especially the leads of Albert M. Dalcq, "Form and Modern Embryology," and Konrad M. Lorenz, "The Role of Gestalt Perception in Animal and Human Behaviour," in L. L. Whyte, ed., *Aspects of Form* (London, Percy Lund Humphries & Co. Ltd., 1951); also of L. L. Whyte on formative processes in his many publications, particularly *The Unitary Principle in Physics and Biology* (London, Cresset Press, 1949).
3. Practice of social work in the fullest sense is in fact the only field of applied human ecology that I know of. In direct relation to the ideas presented here, I find that in 1940 Dr. Eduard C. Lindeman, Professor of Social Philosophy at the New York School of Social Work, saw "Ecology" as "an instrument for the integration of science and philosophy" in a paper of that title ("Ecology: An Instrument for the Integration of Science and Philosophy," *Ecological Monographs, 10* [July 1940] pp. 367-372), although he did not apply this directly to social work.
4. The Edith Cobb Collection, now in the possession of the New York School of Social Work, Columbia University.
5. Julian Huxley, *Evolution: The Modern Synthesis.* New York, Harper & Brothers, 1943.
6. Keats' term for intuition. His *Letters* embody a highly developed theory of cognition, resembling also Wordsworth's and Traherne's.
7. Arnold Gesell, *Embryology of Behavior.* New York, Harper & Brothers, 1945.
8. W. H. Thorpe, *Learning and Instinct in Animals.* Cambridge, Harvard University Press, 1956.
9. Conrad Aiken, *A Letter from Li Po and Other Poems.* New York, Oxford University Press, 1955.
10. Geoffrey H. Hartman, *The Unmediated Vision.* New Haven, Yale University Press, 1954.
11. Marjorie L. Hourd, *The Education of the Poetic Spirit.* London, William Heinemann, Ltd., 1949.
12. John Oman, *The Natural and the Supernatural.* New York, The Macmillan Company, and Cambridge, Cambridge University Press, 1931.
13. Dorothy Waley Singer, *Giordano Bruno, His Life and Thought.* New York, Abelard-Schuman, Limited, 1950.
14. Bernard Berenson, *Sketch for a Self-Portrait.* New York, Pantheon Books, Inc., 1940.

TEXTS AND MOTIFS

Reflections of John Dewey: Excerpts from Unpublished Correspondence

In January 1930 John Dewey wrote a letter to Corinne Chisholm (later Mrs. Frank G. Frost) in reply to comments she had sent him on his book *Experience and Nature*. They were strangers to each other, but they found they could communicate creatively on philosophical topics. The correspondence continued for twenty years.

In view of the approaching centenary of Dewey's birth (20 October 1859) Mrs. Frost has made available to *Dædalus* this selection from the hundred and fifty letters from John Dewey addressed to her, none previously published. We wish to express our thanks to her and to Mrs. Dewey, who has graciously concurred. The excerpts reflect Dewey in his last creative phase, now searching for an intimation of unities in esthetics and science, now responding to a problem with his dry wit and his deeply felt humanity. His greatness is perhaps seen best in the range and courage of his opinions.

Hubbards, Nova Scotia
Sept. 7 '30

Dear Corinne Chisholm,

. . . I have been reading the esthetic books[1] – a branch of philosophy in which I have never before read extensively. You may be interested in some suggestions that have come to me.

(1) Speaking generally, ancient (Greek) theories regard art as imitation – construed somewhat freely, the underlying idea is the "truth" of artistic products to some reality. The point of view – like that of ancient philosophy in general – is objective, cosmic. In the same general way, modern theories emphasize a contribution made by the subject or organism – tho differing enormously as to what the psychological element is which functions and renders the experience

artistic or esthetic. Both theories neglect, from opposite poles, the fact that *every* experience is constituted as an *interaction* of subject and object.

(2) I have a feeling that at this point the concept of *interception* is very important. The *completeness* of the interception determines the measure of the esthetically satisfactory [ness] of the subject matter of the experience – the completeness with which the factors, of subjective and objective, engage one another, without loose ends or unsatisfied elements. (There would be some degree of the esthetic in every experience, because without some interlacing there would be no experience.)

(3) The completeness of the engagement renders the experience static. This fact raises the question as to why the full esthetic experience isn't just hypnotic. How does it move, develop? I haven't got far with this, but evidently somehow the new self that is created involves certain tensions in itself that surpass the objective phase of the adjustment. Perhaps, more simply, the fact that the objective elements are part of a larger world, and change – with change in elements that are not exactly fitted in – compels a dissatisfaction in which the idea (mnemon) of the accomplished interception operates as a regulative *ideal* to bring about new interceptions, and so on.

This isn't clear however. Perhaps it is simply that no interception can be 100 per cent complete.

Well, on the first point it is interesting to see how the errors and confusion of theories in esthetics can be traced to isolation of subject and object in constituting an experience.

Sincerely your friend,
JOHN DEWEY

408 Green St., Key West, Fla.
April 1, '38

Dear Friend,

. . . What you say about radiation, retardation and reversal is very enlightening. N. Y. University has a fund left them for lectures on "Time and its Mysteries." They asked me to give the lecture this year – 21st of April. I have written a somewhat rambling piece which I call Time and Individuality – more a collection of remarks and reflections than an attempt to go very deep. But your letter makes me wonder whether I made a mistake in one section. I was referring to

the 18th-century idea of indefinite perfectibility and progress as antecedent of the idea of evolution, and the consequent optimistic interpretation of the latter – then I said that degenerations, like cancer, or Nazism were also "developmental" in nature, and that the basic question wasn't whether the development was in a desirable or undesirable direction, but whether change was something more than re-arrangement of external spatial conditions.

What you say about relapses to the older has raised a question in my mind. Maybe I was wrong. But there seems to be something new in – say of both cancers and Nazism – they don't seem to be *mere* relapses – but perhaps the real developmental aspect is that the relapse occurs under conditions which also present genuine opportunities for evolutions in the positive direction. What influenced me chiefly is the fact that the idea of development as inherently "progress" is bound up with the idea that it takes place from some cosmic necessity and therefore exempted individuals from the responsibility of seeing to it that change is progressive instead of retrogressive. I shall be glad to have your opinion on the whole matter. Again thanking you,

With affectionate regards, Yours,
JOHN DEWEY

Hubbards, Nova Scotia
Sept. 11, '38 –

My dear friend,

. . . On the moral side I think "parental care" has been overdone as an exclusive factor. There are many situations demanding many kinds of "care" – in all the sense of that word, attention, solicitude or anxiety, and nourishing. They developed too independently of one another – necessarily in dealing one by one with different kinds of situations – and the result is a highly criss-cross and conflicting morality. They need unification in an inclusive "care," but even in the present confusion morality or conduct is much fuller and richer than it would be than if the unity had been attained by working simply on one line of care like the parental. Observation shows for example many cases in which parental care isolated from other cares and carings works disastrously. . . .

Devotedly your friend,
JOHN DEWEY

Hubbards, Nova Scotia
July 22, '39

Dear friend Corinne,

It's a month at least since I got your letter written on your way back from your northern trip – did you get to Burlington on your way thru Vermont? It's a lovely place where I had the luck to be born. . . .

The Cyclopedia monographs[2] have been pretty disappointing so far, it seems to me. I think the philosophy group, the "logical positivists," started too much from the formal logical end, and while they might do a great deal from the language side, their hard and fast distinction between syntax as form and vocabulary (meanings) as matter is a handicap hard to get over. I have an outline of a paper Morris of Chicago is going to read, on unifying the humanistic and physical sciences – but instead of starting from principles – like your distribution of strains for example – even one of them, even if by itself it didn't get very far, would be better – he starts from a theory of signs labeled semiotics. What is the use until he has signs themselves placed in some kind of a unified natural scheme? Aside from an undue interest in formal logic, derived from mathematics of Russell by way of Wittengenstein, they are too much interested in a short cut, by way of linguistic syntax to get rid of a lot of philosophical lumber – it ought to be got rid of but if they would do something more real a lot of it would just drop away.

Well I have no business especially to talk because I don't know enough science to do anything about it, but I am not being flattering when I say you have a lot more to teach most of them than you can learn from them. But I don't doubt you can get a lot by way of personal contact outside of the formal addresses from such men as you have had contact with. I think you could drop a sort of bomb shell in some of the formal discussions by asking if after all they think there is any way to unify science except by getting at and starting with the unity of Nature's processes. . . .

A man at Northwestern, Schilpp by name, had the unhappy idea of getting fifteen or more people to write articles about my books and articles, and I have had to write a reply to their criticisms. The articles fall mainly into two classes, former students who think I'm mostly all right and other philosophers who think that if I have ever had two ideas that hung together it was a piece of good luck – then there are

a few intermediate ones that criticize me some but think I have said some things worth saying: the Unity of Philosophers!

My daughter Jane and I are here until Sept. 1st. I take it you are back in N.O., so I am sending this there.

Affectionately your friend,
DR. JOHNNY

1 West 89 St., New York City,
December 1, 1940

Dear Friend,

. . . You may be at least amused by the following—an instructor at Columbia who studied at Harvard and with Whitehead said he heard the latter say several times—"I've only one thing against Dewey—He's a Vermonter, so he's too cautious"—very 'cute of him, I think, but he is an extraordinarily 'cute human being. . . .

Affectionately yours,
J.D.

1 West 89 Street
New York City,
June 28, 1941

Dear friend,

I was as always interested in getting your thoughtful letter. I don't think you are actually in much danger of being too summary or too broad in classifications. . . . Of course what you say about the current attitude of men is quite true; having had three daughters, two of whom have engaged at different times in some form of self-supporting professional work, I have had impressed upon me the immense split between the realities of the opportunities of women and the official theory about equality. When I was in Edinboro some years ago I was struck by the fact that women teachers in the University had a more taken for granted state of equality with men teachers than I've seen in this country. That you have to start from the prehuman level is certain, since the distinctive thing in your whole approach lies in the natural connections you show exist between things separated in present science as well as in common beliefs. . . .

I have been trying to write a semi-popular interpretation of the course of modern philosophy. The leading idea is that the problems and the different philosophies (attempts at solution) of modern times

have their source in the strains, tensions, produced by the (relative) dissolution of the medieval synthesis, and that one of the main methods in dealing with them has been to *distribute* them, but not in the way in which you point out strains are distributed by nature, but merely by putting each one element in its "proper place" where it won't touch and interfere with others—that is, without *doing* anything, or by a purely *intellectual* location. This is one, I find, of three main methods employed, but all of them have implied that the tensions could be resolved in the "i"[3] field, which amounts to saying by words—or in discourse. I'm trying something different from what I've done before and I have no idea how it is going to come out. I want to show that the confusion and chaos of so much of modern life is due first to the emergence of the new forces, Protestantism, Nationalism, democracy, industrial revolution, new physics, etc., from out the medieval synthesis and secondly to the fact that many of the fundamental ideas of the old synthesis were *not* discarded but were carried over into the systems that attempt new philosophical formulations, and thereby has prevented the development of a synthesis which actually corresponds to the vital conditions and forces of the present. The vigorous attempt of the Catholic Church at present and educational reactionaries—Hutchins of Chicago for example—to show that "order and unity" can be restored only by going back is a symptom that we have reached a critical stage where discard and reconstruction are imperative—totalitarianism of the other type is doubtless a symptom too. I am afraid the confusion and reaction will have to go further, however, before there will be an emergence, but maybe I'm too pessimistic.

With sincere regards,
Affectionately yours,
JOHN DEWEY

1 West 89th Street,
New York City,
June 23, 1942

Dear friend,

. . . I haven't seen Reisler's [*sic*] book.[4] Your quotations aside from the one you call attention to as indicating a cleavage on his part, seem to me to make it highly doubtful whether you will get any basic help. When a man begins to talk about the cleavage between man

and nature as one between "inner" and "outer" experience, I think his cleavages are pretty fundamental. I anticipate he will get over it by assimilating what he thinks is outer to what he thinks is inner. In other words, he is a German philosopher. I hope I'm wrong—but "following the lead of inner experience" is a very give-away phrase. As far as the *problem* is concerned, there is no doubt, that [the problem] of modern life is separation of man from nature. But it will hardly be resolved by a "scheme of concepts." Following further and through the lead of *science*—but not as outer experience over and against inner—as you are doing is the only way I see. Perhaps I am over-influenced by the material I'm at work on trying to shape a book —the main thesis being that the "modern" movement hasn't expressed itself in its own terms but in those which are a mixture of old and new, and I'm over-sensitive in finding exemplifications of that fact in such sentences as you quote. But we've got to go on and see the thing through, not go back and try to revive and revise the old. . . .

Affectionately yours,
JOHN DEWEY

Summer address
Lake Valhalla,
Montville, N. J.
Aug. 3, 1943

Dear Corinne,

It was as always a pleasure to hear from you and get some additional notes on your progress.

I have had some criticisms and some compunctions lately about my frequent use of "situation." I have only to read a little of B. Russell to reassure myself that the word has a useful place. His isolation of Brutus killed Caesar[5] is a sample. In some of his earlier writings he said that in an ideal language there would be one word for every particular event that occurs—"atomic realism" I think he called it. Really I congratulate you if you can tell what his writings "stem" from—they seem to be so terribly arbitrary. Then the strange thing is that he often refers to the immense size of the astronomical universe in comparison with the pimple point of this earth and of infinitesimal man on this earth to rebuke those who treat human affairs as important. I have to confess he irritates me much more than he enlightens me even negatively.

I found in this house my daughter rented for the summer a volume of Robert Frost's poems—I imagine his last [latest] output. There is a poem there that hits off Russell's attitude beautifully, I thought. (The book is called *A Witness Tree*—the poem is "The Lesson for Today".)* The poem begins

> If this uncertain age in which we dwell
> Were really as dark as I hear sages tell,

and it goes on to comment on contemporary pessimism in literature and life—especially as it is nourished by the kind of supposedly scientific thing of B. R.'s mentioned above.

The particular passage is

> Space ails us moderns: we are sick with space.
> Its contemplation makes us out as small
> As a brief epidemic of microbes
> That in a good glass may be seen to crawl
> The patina of this least of globes.

The poem is supposed to be in the form of a conversation—one-sided—with a medieval scholar—and so he goes on

> You were belittled into vilest worms
> God hardly tolerated with his feet;
> Which comes to the same thing in different terms.
> We both are the belittled human race,
> One as compared with God and one with space. . . .
>
> The cloister and the observatory saint
> Take comfort in about the same complaint.
> So science and religion really meet.

I think that last sentence is priceless. Frost is a good deal of a philosopher in a way. One short poem is called "Happiness Makes Up in Height for What It Lacks in Length."

I am struck by what you say about an event. B. Russell, and he isn't the only one, cuts an event down to a knife-edge thinness. I have been thinking of late about the difference between occurrence

* Lines from "The Lesson for Today" from *A Witness Tree* by Robert Frost. Copyright, 1942, by Robert Frost. Reprinted by permission of Henry Holt and Company, Inc., New York, N. Y.

and event—there is nothing superfluous in the phrase "occurrence of an event." The word "happening" has a lot of philosophy in it. It may be an accident or it may be a happiness.

I have been thinking a good deal of late about language with respect to one phase of it—perhaps its main function: that of picking things out of what Whitehead calls the welter and arranging them so that they have form or pattern exactly as a painter picks out certain things and arranges them to make a painting as a work of art. I think it helps in getting rid of the superstitious attitude toward "Science." Of course, on [*sic*] this view language itself has to be seen to be an event or transaction in space-time, which, because it is an event, interacts with other events to modify them and be modified by them. The view that language, words, is merely a matter of clothing ready-made mental somethings with sound or physical figure is a terrible obstacle to any sound understanding;[6] *i's* are products of language viewed as an actually occurring social event—maybe at first they are by products or "incidents"—they fall in and out; however, I'm getting over my depth now.

This place is in the woods, quite thick—not a high elevation but with the water, a small lake, and the trees, much cooler than in the city—especially nights. The house—a big living room and an outside stone porch or platform—no roof covering—fine to sit on and read and work. . . .

Affectionately yours,
JOHN DEWEY

1158 Fifth Ave.,
New York City,
Dec. 7, 1949.

Dear friend,

You are undoubtedly right about Whyte;[7] as more and more factors are involved in an operation (more diverse as respect to one another as well as more in number) asymmetries and deformations are bound to intervene and to be the occasion of developments that can rank as "mutations." There is only one point in which I could disagree at all from what you say and that is verbal.

I've been increasingly impressed with the attachment of human beings to fixities as the sole ground of stability and security. Of course I dealt with one aspect of that in my *Quest for Certainty*.[8]

But what now specially impresses me is the fact that in spite of the steady movement (i) of science toward recognition of change, involving elimination of fixities as assets of understanding, and (ii) movement of human relations and institutions toward universality of change, theories of a general sort still insist upon introducing fixities that confine change within fixed boundaries. The evidence from science is furnished by (i) the relativity theory according to which space and time (which in Newton's theory were fixed limits of change) are part of the subject matter that changes, and (ii) the new atomic theories which have destroyed their old complete rigidity by transforming one kind of atom into another.

On the human side the result is more disastrous. Acceptance of fixed laws prevents study of the direction of change as it goes on, understanding of which is the indispensable condition of intelligent guidance of change. Its lack increases the tendency toward chaos or uncontrolled deformations (and injuries).

Social "science" waits upon a grasp of the fact that the only possible stable coordinations are now *equilibria of movements* in respect to one another. Before the fact of ever accelerating change was so dominant as it is now, the consequences weren't so disastrous. Now that practically all things are "in process," failure to study the directions in which they are moving constitutes the present world disorganization and increases the need for the work in which you are engaged.

The bearing of this upon the verbal difference between us is that I incline to use "process" as a name for *change*—changing as the universal principle, in which case some other word would be needed for the kind of changing that tends to revert to an earlier stabilization. Not that it doesn't exist but that it is an aspect or phase of "process" in its fuller sense that has to be taken into *account* in order to bring it under intelligent direction—which as a case of superfluity, since intelligence *is* the perception or awareness of the direction of changes that are going on anyway that enables *us* to direct (guide, steer) them. . . .

Affectionately,
JOHN DEWEY.

REFERENCES

1. Dr. Dewey did not mention the names of the esthetic books he had read.
2. *International Encyclopedia of Unified Science* (Chicago, University of Chicago Press, 1938), a contribution to the science of semiotics by Rudolph Carnap and others.
3. Conflict among old and new elements of experience requires actual transactions, changes, functional adjustments, since a situation is not modified toward harmonious relations among its components merely by segregating these elements ideationally ("i").—C. C. F.
4. Apparently this refers to Kurt Riezler, *Physics and Reality* (New Haven, Yale University Press, 1940).—E. D. B.
5. See Bertrand Russell, *An Inquiry into Meaning and Truth* (New York, W. W. Norton & Company, Inc., 1940), p. 46.
6. Language and ideas are derivatives of experience, and have no status as things independent of the experience that generated them and that may or may not sustain them, in ever changing situations.—C. C. F.
7. See Lancelot L. Whyte, *The Next Development in Man* (New York, Henry Holt and Company, Inc., 1948), p. 240.
8. John Dewey, *A Quest for Certainty: A Study of the Relation of Knowledge and Action* (The Gifford Lectures, 1929). London, G. Allen & Unwin, Ltd.; New York, Minton, Balch & Co., 1929.

NOTES FROM THE ACADEMY

The First Darwinian Debate in America: Gray Versus Agassiz

A. HUNTER DUPREE

CHARLES DARWIN'S leading ideas were the subject of a full-dress public debate between two American scientists, Asa Gray and Louis Agassiz, shortly before *The Origin of Species* appeared just a century ago. That they understood the issues and brought to bear on them large bodies of scientific data, that a platform was available to them, that printed proceedings carried the debate to the learned world—all this is a tribute to the maturity of American scientific institutions in 1859. The American Academy of Arts and Sciences in Boston provided the machinery for this confrontation of ideas on a fundamental subject before the general public on either side of the Atlantic had become aware that the problem was open.

Many of the most inflammatory controversies usually connected with Darwinism were startlingly absent from the first American debate, rendering it more nearly germane to the scientific question of species than were more famous later encounters, such as that between Thomas Henry Huxley and Bishop Samuel Wilberforce. No one mentioned Genesis, or the place of man in nature, or sexual selection, or pangenesis, or the descent of man from the higher apes, or even the survival of the fittest. Yet in their fidelity to detail Gray and Agassiz were entirely aware of momentous philosophical issues. They knew that they were on opposite sides of the great gulf that divides empiricism from idealism, and they sensed that Darwin's ideas would play a major role in this age-old struggle.

Asa Gray, the Fisher Professor of Natural History at Harvard, had been corresponding with Darwin since 1855 and had recast much of his extensive knowledge of the plants of North America into a statistical form that would bear on the "theoretical notions" which reached him through questions contained in the letters he received from Down. In September 1857 Darwin had sent Gray the

outline of his ideas on the origin of species, which conveniently provided one of the bases for his priority over Alfred Russel Wallace. Gray had also in his hands by 1858 collections of dried plants from Japan. These first fruits of American scientific exploration of Japan put Gray in the unique position of being able to compare the Japanese flora with that of North America, and hence to add signally to the infant science of plant geography—one of the main buttresses of *The Origin of Species.*

Louis Agassiz, then at the height of his fame after a dozen years in the United States, outshone Gray, his quiet botanical colleague on the Harvard faculty. In 1857 Agassiz had published as part of the first volume of his *Contributions to the Natural History of the United States* an "Essay on Classification," which put forward a whole system of nature as the result of a divine plan, a reflection of the mind of the Creator. Behind his conception was all his own prestige and that of his master, Baron Cuvier, and all of the force of German idealist philosophy and its American cousin, transcendentalism. Yet Agassiz was paying for his fame with the tensions that sprang from too many activities. An immensely popular lecturer, he was in the early months of 1859 deeply immersed in founding the Museum of Comparative Zoology at Harvard, an enterprise that required prodigies in fund-raising and organization. Hence a debate on the origin and nature of species as indicated by their geographical distribution was an unwelcome intrusion into an already overloaded schedule on the part of a question that should have been laid to rest with the appearance of the "Essay on Classification." Gray had to take the initiative if a debate were to take place.

On 10 December 1858, Gray, having completed his analysis of the Japan collections, was ready to tackle Agassiz with a specific case, one that would show the genetic connection of species through geologic time and hence would destroy Agassiz's completely idealistic conception of a species. Before the small and intimate Cambridge Scientific Club, made up mainly of Harvard professors, and in the presence of Agassiz, Gray presented his ideas on the relations of Japanese and North American plants. Agassiz, it was recorded, "took it very well indeed."[1]

On 14 December 1858, Gray sent a paper to the American Academy of Arts and Sciences, of which he was corresponding secretary, on the characters of the plants collected in Japan by Charles Wright of the North Pacific Exploring Expedition, together with "A Notice of

the Vegetation of Japan in its Relations to that of the Northern Temperate Zone Generally."[2] This paper was published some months later in the *Memoirs* of the Academy, but Gray still felt the need of making clear the trend of his ideas in person before the group.

On 11 January 1859, the Academy met in the Boston parlor of Gray's father-in-law, the lawyer Charles G. Loring. Gray knew well that it was a dramatic moment, for he invited his friend and mentor, John Torrey of New York, to come to Boston to hear him "knock out the underpinnings of Agassiz's theories about species and their origin; show . . . the high probability of single and local creation of species, turning some of Agassiz's own guns against him."[3] Twenty-two members of the Academy were present, with Jacob Bigelow, the president, in the chair. The secretary, S. L. Abbott, kept a very brief minute of the debate, while both Gray and Agassiz later furnished written versions of their remarks for the published *Proceedings*.

Gray began by showing that the "relations of the Flora of Japan with that of the United States east of the Mississippi were peculiarly intimate, as evinced by the great number of congeneric, of closely representative, and of identical species in the two floras." Then he connected his body of data with the species question.[4]

> In presenting the subject, Professor Gray could hardly avoid using the words "interchange" and "dispersion of species." He had used them only in drawing his conclusions from the facts, and wished to do so without prejudging the question involved. But he was free to say that the present investigation had confirmed his impression that such terms were properly employed. For although some of these facts would at first seem most readily explicable upon the supposition of the double origin of those species whose present geographical areas are widely dissevered, yet, in his opinion, they would be found, on considering the whole case, far more conformable to the hypothesis of a single local origin for each species at an early time. And in his opinion the actual question now is,—whether each species originated in one local area, whence it has spread, as circumstances permitted, over more or less broad tracts, in some cases becoming discontinuous in area through changes in climate or other physical conditions operating during a long period of time; or, whether each species originated where it now occurs, probably in as great a number of individuals occupying as large an area, and generally the same area, or even the same discontinuous areas, as at the present time. The latter is understood to be the view of Professor Agassiz.

Having thus named his adversary and described the elements of the zoologist's case which he would attack, Gray continued:

1. That it offers no *scientific* explanation of the present distribution of species over the globe; but simply supersedes explanation, by affirming, that as things now are, so they were at the beginning; whereas the facts of the case—often very peculiar—appear to demand from science something more than a direct reference of the phenomena as they are to the Divine will.
2. That the idea of the descent of all similar or conspecific individuals from a common stock is so natural, and so inevitably suggested by common observation, that it must needs be first tried upon the problem; and if the trial be satisfactory, its adoption would follow as a matter of course.
3. That, since it is conceded that the present era of the world is of extremely long duration, and since it is most probable, not to say certain, that the existing species of plants of the regions in question, or a part of them, are of high antiquity, dating back to the post-tertiary, or even to the later tertiary epoch,—and therefore must have been subject to great climatic changes, accompanied or caused by no inconsiderable changes in the relative extent and configuration of the land,—the objections formerly raised against such wide dispersion of species lose most of their force. And the explanation of such anomalies in the actual distribution of species is to be sought in the vicissitudes to which the species must have been subject in their earlier days.

Agassiz's rejoinder in the form he furnished in writing after the meeting was brief:

He acknowledged the correctness of the views ascribed to him by Dr. Gray, and would defend them on the ground that, connecting the present state of things with that which prevailed in earlier geological periods, it could be shown that the present distribution of animals was linked with that of earlier periods in a manner which excluded the assumption of extensive migrations, or of a shifting of the florae and faunae from one area to another.

The secretary's minutes of the meeting itself, however, reveal both something of Agassiz's animation and his opposition.[5]

Prof. Agassiz expressed great interest in the statements and opinions of Prof. Gray, and said he regarded them as of very great importance with reference to the question of the common origin of species—His own opinion, founded on observation of the animal Kingdom, was different from Prof. Gray's, inasmuch as he believed that distinct species were originally created about in the positions which they now occupy upon the Earth's surface, allowance being made for a greater or less effect upon them from existing agencies—In the Animal Kingdom facts point that way. There may be a difference between animals and vegetables in this respect.

Continuing from the revised version of the meeting as published in the *Proceedings*, one finds that Agassiz was objecting to the origin

of species in a single pair by appealing to a factor Darwin would use in a very different way—the struggle for existence. It was a truly amazing argument: [6]

> With reference to the single origin of conspecific individuals, he thought that the warfare which so many species wage upon others was in itself an insuperable objection to the assumption that any one species could have originated in a single pair.

Agassiz thus came within a hair's breadth of the principle of natural selection, only to use his insight to bolster his denial of the genetic connection between the members of a species.

Gray was not able to present his entire case in one evening, but promised to "illustrate his views" on the mechanism "at a future meeting." On 26 January 1859, at a stated meeting of the Academy, Agassiz moved for "special meetings for scientific discussions" in February, March, and April, and Benjamin Peirce suggested that these meetings be opened to "persons not Fellows of the Academy who would be likely to be interested in the proceedings such as advanced students of science."[7] Thus Agassiz was seemingly anxious for a renewal of the debate.

On 22 February Gray took the floor to "indicate some of the vicissitudes to which our extant vegetation must have been exposed in earlier times, and which must have influenced the geographical distribution of species."[8] Again Gray submitted a written version of his remarks for the published *Proceedings,* including details of his geologic and paleontologic evidence for changes in climate both before and after the great Ice Age. Gray's final remarks bore directly on the issue between Darwin and Agassiz:

> In conclusion Professor Gray remarked, that, when we speculate about the *origin* of species, we launch out beyond the region of induction, and have only analogies or probabilities to guide us, which we have to weigh one against another as well as we can. And he deemed it very important to the progress of science that different investigators should start from independent and opposite preconceptions or lines of thought. His preconception was that of the local origination of species; not origination in single individuals or single pairs,—which might or might not be the case in different species. The improbability of single origin appeared to him to be great in the lower grades of animals; the probability of it greater and greater as we rise in the scale of being. But the local origination of each species appeared to him not only the natural hypothesis to begin with, as he had before remarked, but also the one which, on applying it to the case in hand, he thought best adapted to explain the actual distribution of plants.

Although not inclined to defer too much to *a priori* reasoning, he thought it was suggested by philosophical considerations, as well as by the induction of observations; being a natural inference from Maupertuis's principle of *least action,* viz. "that it is inconsistent with our idea of Divine Wisdom to suppose that God would use more power than was necessary to accomplish a given end." According to Professor Peirce, this principle is strictly verified in all the mechanical arrangements of the universe; so that we cannot but think it applicable to the organic world also;—in which there would appear to be a vast waste of power, if, in the case of beings endowed with such immense multiplying power as plants, as many individuals were created *ab initio* as there were ever subsequently to be.

In judging this last argument, it is worth remembering that the mathematician Benjamin Peirce was a friend and ally of Agassiz in many a battle on the Harvard faculty, so that Gray was again using the technique of turning his opponents' arguments to his own use.

By this time Agassiz was so harassed by the problems of the Museum of Comparative Zoology, by a controversy with James Dwight Dana, and by headaches and eye trouble, that he was not able to revise his remarks in writing for publication. Hence his words carried in the published *Proceedings* of the meeting of 22 February are in fact the minutes of the secretary:[9]

Professor Agassiz argued that climate has very little to do with the distribution or specific characters of animals, from the facts observable at the present time. Near the poles, he remarked, the conditions of existence are quite uniform, and in the tropics they are the same so far as climate is concerned. In the arctic regions we find many animals absolutely identical in both hemispheres, and many very closely related to each other; in the regions of the tropics, on the other hand, there is no similarity in the animal life of the two hemispheres, although the climate is the same. It is evident, therefore, that the peculiar characters of the Faunae of these regions cannot be ascribed to the influence of climate. In passing from the arctic to the tropical regions, the uniformity of animal life in the former passes gradually into the extreme diversity of that in the latter, and in the causes of difference in the tropics Professor Agassiz said he saw the reasons for all differences, wherever observed.

How far back, he asked, does this state of things go? In the tertiary times of Australia the peculiar types of animal life existed which give at the present time the distinctive character to its Fauna, and the same is true of the tertiary Fauna of South America. These facts, and others like them, have led him to believe that animals were primarily distributed over the surface according to a plan hardly intelligible to us, but independent of climatic influences. This plan he believed included the preparation for the earth's surface and the various external conditions of their existence for its inhabitants, before they were created, very much as a

householder lays his foundations and builds the superstructure and arranges the furniture of the interior for his residence before occupying it.

Agassiz then indirectly cast doubt on Gray's ability as a taxonomist and brought to bear his own knowledge of geology and zoology:

Professor Gray had quoted a number of plants as identical in the tertiary and the present period. Des Hayes and Lyell had admitted the same with regard to the animals of these periods. Professor Agassiz said he had doubted the fact in the case of animals, and had therefore early in his scientific career collected many specimens to settle the question, and in every instance where he had sufficient materials he had found that the species of the two epochs supposed to be identical by Des Hayes and Lyell were in reality distinct, although closely allied species. He was therefore inclined to ask whether it might not be possible that the same is the case with the plants of the tertiary period and those of the present day? He could not but believe that, if Professor Gray were to exercise the same critical judgment upon the fossil Flora which he does with reference to the existing Flora, he would find differences between the species of the two epochs similar to those found in the animal world. There is not, at the present time, he added, an equal knowledge of all the facts in Botany and Zoölogy.

The debate at the American Academy was nearly over. At the March supplementary meeting Charles Pickering, veteran of the Wilkes Expedition, spoke on geographical distribution in a way that would support single centers of creation, and Gray put in a rebuttal to Agassiz's February remarks.[10]

Professor Gray, in a brief rejoinder to the remarks of Professor Agassiz . . . suggested that an obvious reason why the terrestrial species of the arctic regions were so generally alike round the world, while those of the temperate zone were less so, and those of the tropics mostly different, might be found in the geographical position of the regions in question,—the masses of land in the former being essentially contiguous, in the latter widely remote; so that species might naturally have been diffused round the whole circumpolar regions, but this could not be expected in the widely separated tropical regions, except as to maritime species; and, in fact, the strictly maritime plants were largely the same on both sides of the ocean. That is, the actual distribution was *as if* species had spread over as much of the earth's surface as they have had a chance to reach and occupy. Professor Gray, moreover, did not think that "the climate is the same" throughout the tropical regions of the two hemispheres, or comparable with the arctic regions in respect to uniformity, but he supposed that the great diversity of species in the former stands in relation to diversities of climate, station, and other physical circumstances, though these, of course, are not the cause of the diversity. Finally, the interposition in West-

ern North America of a flora generally different from that of Japan and of Eastern North America, Professor Gray thought perfectly compatible with the theory of an interchange between the two last, since the line of dissemination must have followed the isothermals,—the curves of which appear to have been essentially the same in tertiary and post-tertiary times,—and therefore trended far to the north on the western side of the American continent, leaving the existing Oregon-Californian flora always as peculiar as now.

At the regular monthly meeting in April Agassiz made one last indirect counterattack by supporting the report of his assistant, Henry James Clark, on spontaneous generation. Clark insisted that his results in experiments with closed vessels agreed with those of F. A. Pouchet, who was then discussing the question in the French Academy.[11] Agassiz, of course, needed spontaneous generation on a huge scale to repopulate the earth in the successive creations he envisaged, and he did not know that he was stepping directly in the way of Louis Pasteur.

The American Academy, in serving as a forum for the first great debate in America on the origin of species, had allowed the argument to proceed in such a perfectly orderly and rigorously scientific way that no appeal to the usual passions aroused by the development theory could be made. There is no record that Darwin's name was mentioned in the meetings. Gray had been extremely careful not to argue for the transmutation of species by natural selection, but only for creation in a single locality and for migration from there with a genetic connection between all members of a species. Yet Gray, at least, knew that Darwin's theory and even his scientific method were on trial in the argument over single centers versus multiple centers of creation. For not only did members of species migrate, but members of genera which showed specific differences followed the same pattern. In a note[12] written to his original paper not later than 25 April 1859, Gray specifically pointed to the relevance of Darwin's ideas and announced his partial adherence to them, going further in public than had any other scientist in the Western world save Darwin and Wallace themselves:

The fundamental and most difficult question remaining in natural history is here presented—the question whether this actual geographical association of congeneric or other nearly related species is primordial, and therefore beyond all scientific explanation, or whether even this may be to a certain extent a natural result. The only noteworthy attempt at a scientific

solution of the problem, aiming to bring the variety as well as the geographical association of existing species more within the domain of cause and effect, is that of Mr. Darwin and (later) of Mr. Wallace,—partially sketched in their short papers "On the Tendency of Species to form Varieties, and on the Perpetuation of Varieties and Species by natural Means of Selection," in the *Journal of the Proceedings of the Linnaean Society*, vol. III (Zoölogy), p. 45. The views there suggested must bear a prominent part in future investigations into the distribution and probable origin of species. It will hardly be doubted that the tendencies and causes indicated are really operative; the question is as to the extent of their operation. But I am already disposed, on these and other grounds, to admit that what are termed closely related species may in many cases be lineal descendants from a pristine stock, just as domesticated races are; or, in other words, that the limits of occasional variation in species (if by them we mean primordial forms) are wider than is generally supposed, and that derivative forms when segregated may be as constantly reproduced as their originals.

So that no doubt could exist that Agassiz had received a fundamental challenge, Gray entertained the Cambridge Scientific Club on 12 May 1859, and introduced Darwin to the New World. Agassiz had spoken to the same group in March on the "Plan of Creation. In the first Creation, predicting of what is to follow." Gray now "expanded Darwin's views—to see how it would strike a dozen people of varied habits of thought, and partly, I confess, maliciously to vex the soul of Agassiz with views so diametrically opposed to all his pet notions."[13] The idealist system of creation propounded by Agassiz had met a world view fundamentally opposed to it.

That Gray was able to join the issue cleanly if not simply is evidence not only of his own vision and ability but also of the effectiveness of the means American society had provided for the clash of ideas. The main lack, which prevented the settlement of the issues in this debate, was that of a comprehending audience. So few people saw in this technical discussion of the geographical distribution of plants the key to the origin of species that the whole argument had to be repeated many times in less civilized, less scientific, and less enlightened surroundings by lesser men than Gray and Agassiz.

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